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Sentinel Surveys 1995-2001: Catch Per Unit Effort In NAFO Subdivision 3Ps

Pêches de contrôle 1995-2001 : Captures par unité d'effort dans la sous-division 3Ps de l'OPANO

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[1] This series documents the scientific basis for the evaluation of fisheries resources in Canada. As such, it addresses the issues of the day in the time frames required and the documents it contains are not intended as definitive statements on the subjects addressed but rather as progress reports on ongoing investigations.

[1] La présente série documente les bases scientifiques des évaluations des ressources halieutiques du Canada. Elle traite des problèmes courants selon les échéanciers dictés. Les documents qu'elle contient ne doivent pas être considérés comme des énoncés définitifs sur les sujets traités, mais plutôt comme des rapports d'étape sur les études en cours.

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Abstract

Sentinel enterprises collected catch rate and biological information on inshore cod resources in 3Ps for 1995-2001. Data were presented on weekly catch rates and annual relative length frequencies (number at length divided by amount of gear) by year and gear type. Catch rates in 2001 were comparable to the 2000 data, the lowest in the series for both gillnet and linetrawl.

Résumé

Des pêches de contrôle ont permis de recueillir des données biologiques et des taux de capture de la morue côtière dans la sous-division 3Ps pour la période 1995-2001. Des taux de capture hebdomadaires et des fréquences annuelles de tailles relatives (nombre selon la longueur divisé par le nombre d'engins) sont présentés par année et par type d'engin. Les taux de capture de 2001 étaient comparables à ceux de 2000, les plus faibles dans les séries chronologiques des captures au filet maillant et à la palangre.

Introduction

Sentinel survey projects were formally announced by the Minister of Fisheries and Oceans in October 1994. The surveys in the DFO Newfoundland Region are an extension of the index fishermen's project from the Northern Cod Science Project with modifications to allow for science activities achievable only under a fishing moratorium. Sentinel data collection has continued during the index fishery of 1998 and commercial fisheries in 1999-2001.

The sentinel survey has the following objectives:

1. To develop a catch rate series for use in resource assessments.
2. To incorporate the knowledge of inshore fishers in to the resource assessment process.
3. To describe the temporal-spatial distribution of cod in the inshore area over a number of years through, for example, the use of catch rate information, tagging studies, by-catch information and fishers' observations.
4. To gather length frequencies, sex and maturity data and sample ages for use in resource assessment.
5. To establish a long-term physical oceanographic and environmental monitoring program of the inshore areas.
6. To provide a source of biological material for other researchers. For example, tissue for genetic, physiological and toxicological analyses, cod stomachs for food and feeding studies and by-catch information.

Participants

The primary collectors of data in the sentinel survey are inshore fishers. Through consultation with inshore fishers and fisheries organizations, traditional inshore fishing grounds have been identified and mapped, resulting in 16 locations in NAFO Subdivision 3Ps.

Fishers from communities within the boundaries of the identified coastal areas and who met eligibility criteria were invited to apply to participate in the survey. Where more than one application was received from an area, the project partner conducted a draw or lottery to select the participant. While there was considerable interest in the project in most areas, there were many sites from which only one application was received and others where additional canvassing was required to enlist participants. Selected participants were required to complete a six-week course designed by the Marine Institute of Memorial University in consultation with DFO. Topics covered included scientific sampling methods and equipment, computer use, resource assessment basics and presentation skills.

In order to minimize inter-annual enterprise effects on data collection, participants are expected to remain with the survey over a number of years. It is also expected that most of the sampling activities will continue once commercial fishing operations resume and the sentinel participants will form a core of index fishers.

Sites

Sampling was conducted at 16 sites in NAFO subdivision 3Ps. The specific location of each site was chosen after consultation between DFO scientists, fishermen and the Fishermen, Food and Allied Workers Union (FFAW). Site selection was based on the need to survey throughout inshore areas and targeted historical fishing areas and historical gear use patterns. For 2001 a site in Grand Bank was added.

Sampling Strategy

In 1995, sampling was conducted over fifteen weeks. Since then, each site is allocated a minimum number of weeks (12 weeks from 1996-1998, 6 in 1999, 8 in 2000, and 10 in 2001) and additional time is allocated based on fish sale revenue. The timing of sampling was determined after discussions with fishers but was targeted for seasonally appropriate times based on historical fishing patterns. There was minimal disruption of these time frames in 1999 through 2001 due to the opening of the commercial fishery.

There were no traps involved in Sentinel sampling in 3Ps 1999, two traps were used in 2000 and three in 2001. Participants used either baited trawl lines or gillnets for the remaining weeks of the survey. Non-trap sites fished either baited trawls or gillnets for the full survey. While traps are in the water continuously, they were hauled three days per week. Hook and line and gillnet crews fished up to three days per week. Fishing days in the week were selected at the discretion of the crew and depend primarily on weather conditions.

When a cod trap was hauled, the crew estimated how much fish by weight had been caught, removed a random sample for biological sampling and released the remaining catch. Meshed and/or dead, floating fish were retained and brought ashore. Fishers were instructed to release as much live fish as possible.

Hook and line crews fished two tubs of baited linetrawl. Each tub consisted of approximately 500 hooks for a total of 1000 hooks per fishing day. Gillnet crews fished a maximum of six fifty fathom 5 ½ inch monofilament gillnets. Nets were rigged 2-3 to a fleet and up to three fleets were fished per fishing day. In addition, selected sites fished one 3-¼ inch monofilament gillnet one day per week. All fish caught in gillnets and on hooks were landed and measured. If catches exceeded 500 kg per week, the numbers of nets in a fleet were cut back. However, some consideration was given to bottom topography and net performance when reducing the number of nets in a fleet. Similarly, the number of hooks per tub was reduced if landings exceeded 500 kg per week. Other measures were considered if fish are particularly abundant in an area and catches appear to be excessive even with the minimal amounts of gear possible.

Prior to the start of sampling in 1995, a fixed (control) location on the fishing grounds was established for each site and will remain fixed for the duration of the project. Each fishing day, up to half of the gear was set at the control site. When competition with commercial fishers prevented setting at the control site, gear was set as close to the control grounds

as possible. The remainder of the gear (experimental) was set at one or two other locations on the fishing grounds at the discretion of the crew. The location of each fishing set was plotted on a nautical chart. The time of the set and the soak time for the gear were recorded. Other environmental observations were recorded, including wind direction and speed, percent cloud cover, tide conditions, presence of invertebrates (bait) and other fish species in the area, marine mammals, sea birds and any other variables which might have influenced fishing behavior. Selected sites were equipped with a CTD (measuring temperature and salinity at depth). At these locations, casts were conducted in the vicinity of fishing sets each fishing day. CTD locations were fished for subsequent years if possible.

When the gear was retrieved, catches from the control and experimental gear were kept separate and sampled on shore. All fish from gillnet, handline and linetrawl, and a sample of the catch from traps, were measured for length and sex. Otoliths were sampled on a length-stratified basis and stored in manila envelopes with relevant information recorded on the outside. Every other week, selected sites collected a sample of up to 100 frozen fish. These were transported to St. John's for detailed biological sampling. All information was recorded on forms similar to those used by the Port Sampling Section and on DFO Research Vessels

Other biological samples were collected as needed.

Data Presentation

The data are summarized for all of 3Ps and presented by gear type. Summaries for each enterprise follow, in general, organized from east to west. This paper presents data for gillnet (5 ½" and 3 ¼" mesh) and linetrawl. The relative length frequency plot depicts the number of fish at length scaled by total amount of gear fished so that changes in length frequency distribution may be compared across years. Lengths, in 1cm intervals, are from both control and experimental gear, and for gillnet and linetrawl represent every fish measured, as the total catch is measured. Length frequency summaries for NAFO division are shown as an average of the relative length frequencies for each fisher in the division. The second figure on each summary sheet gives catch details broken down by year, including total number of sets (Nhauls), number of sets in which no fish were caught (Nzero), and number of fish caught (Nmeas). The CPUE figures show control and experimental catches combined, in number of fish per net or per 1000 hooks by week and are constructed by calculating a daily catch rate for each set and averaging all the CPUEs for all sets in a given week.

Results

Data summarizing Sentinel Survey activity in 3Ps for 1995 through 2000 are presented in figures 1-76. Fifteen inshore fishing enterprises representing communities from St. Bride's to Burgeo participated in the 3Ps Sentinel Survey for 2000 and 16 in 2001. In 2000 a total of 424 sets of 5 ½" gillnet and 48 sets of 3 ¼" gillnet resulted in total measurements of

6971 fish. Four hundred and four sets of linetrawl resulted in 19127 measurements for 2000. Data collection is ongoing in 2001.

Figure 1 shows all set locations and catch per unit effort in scaled symbols that were surveyed so far in 2001. Linetrawl and gillnet are shown separately. Control sites were generally consistent from year to year but shifts in location may have resulted due to weather or tide conditions or competition for sites by commercial activity.

Gillnet

The summary data for 3Ps gillnet, in Figures 2-34, give an indication of catch rate change since inception of the Sentinel Survey in 1995. Gillnets show the narrowest range of selectivity of Sentinel Survey gears, targeting fish in the 50cm to 80cm range. In general, catch rates from 5 ½" gillnets were lowest in 2000 and 2001, considerably lower than the best catch rates seen in 1996. Most sites showed lower or similar catch rates than those of 1999.

Small mesh gillnets (3 ¼") were used in 3Ps since 1995 in order to get information on smaller size ranges of fish. Figures 35-49 summarize the results. One 3 ¼" gillnet (35 fathoms) was fished in combination with one 5 ½" Gillnet (50 fathoms) primarily on experimental sites. A strong bimodal peak in length frequency distribution results from this mesh size as the gear selects two size ranges of fish. The first and strongest peak, in most cases, is between 35cm and 47cm. Fish in this size range are meshed while the larger fish (52cm to 65cm) are caught by the lips and generally entangle as they twist around.

Catch rates in the small mesh gear were lower in 2000 than those seen in 1996 through 1999. For 2001, there seems to be an increase in catch rate from 2000 of smaller fish caught by this gear.

Linetrawl

Figures 50-76 summarize the data from the linetrawl portion of the 3Ps Sentinel Survey. Linetrawl shows a much wider selectivity curve than gillnet and catches mainly fish between 29cm and 83cm.

Linetrawl catch per unit effort has been declining consistently from 1995 through 2000. For 2001, the relative length frequency indicates a shift towards smaller fish and catch rates are similar to 1999 and 2000.

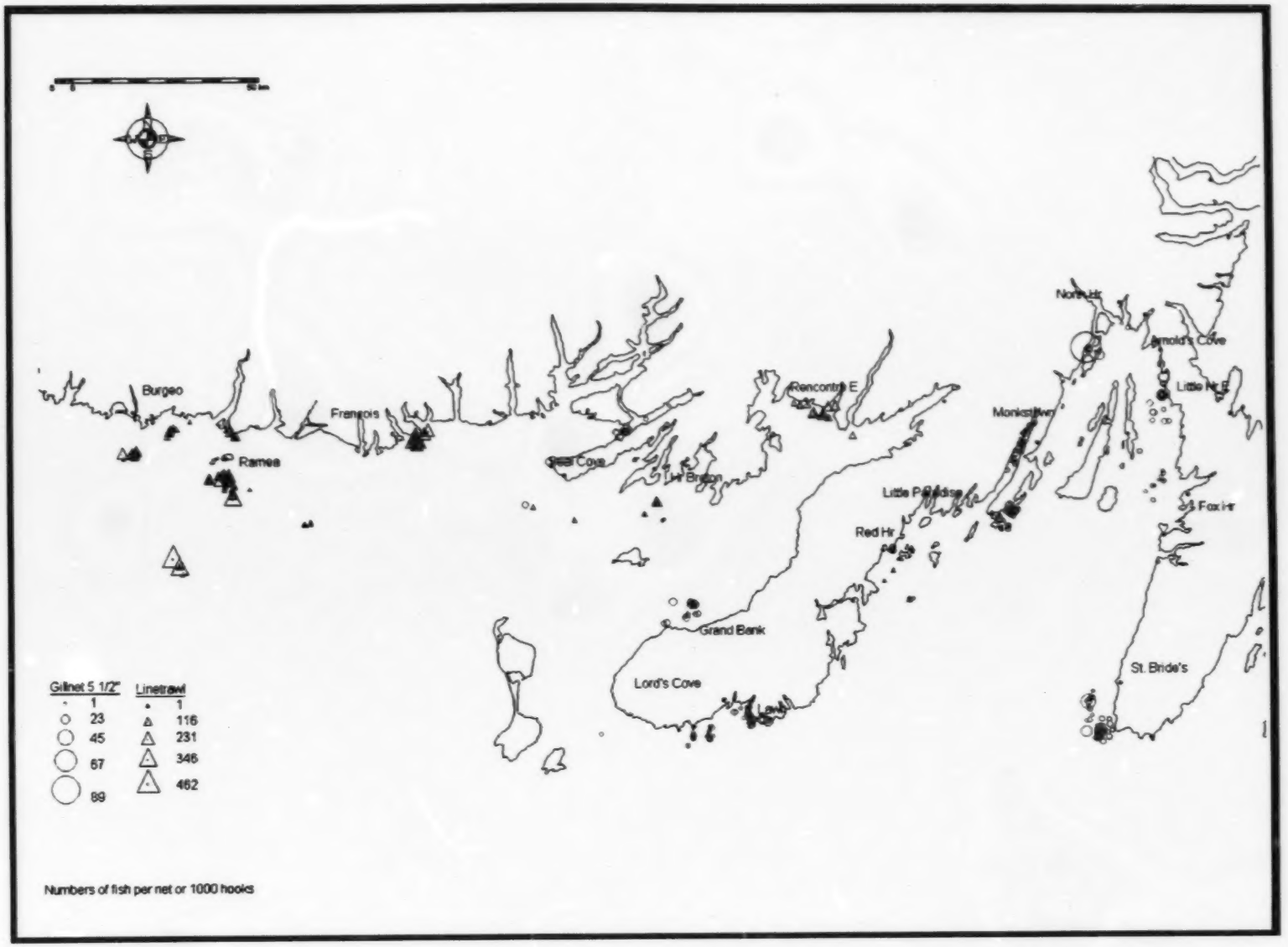


Figure 1. Catch per unit effort (in numbers of fish per net or 1000 hooks) ggillnet 5 ½" and linetrawl in NAFO subdivision 3Ps.

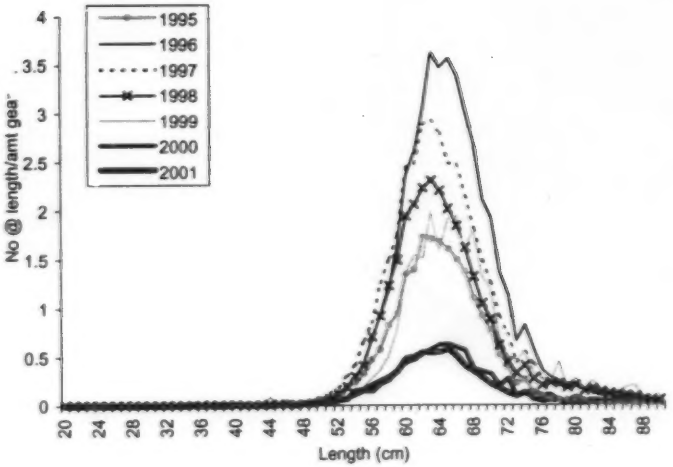
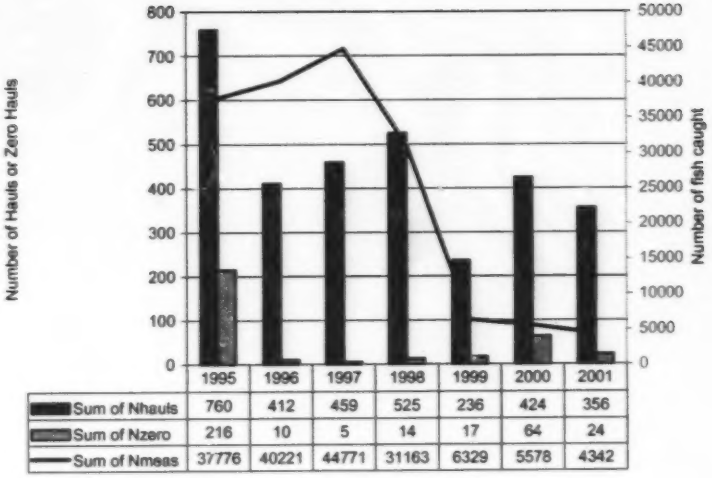


Figure 2. Relative length frequency (number at length / amount of gear) for control and experimental gears, 3Ps Gillnet 5 1/2 in..



	1995	1996	1997	1998	1999	2000	2001
Sum of Nhauls	760	412	459	525	236	424	356
Sum of Nzero	216	10	5	14	17	64	24
Sum of Nmeas	37776	40221	44771	31163	6329	5578	4342

Figure 3. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, 3Ps Gillnet 5 1/2 in..

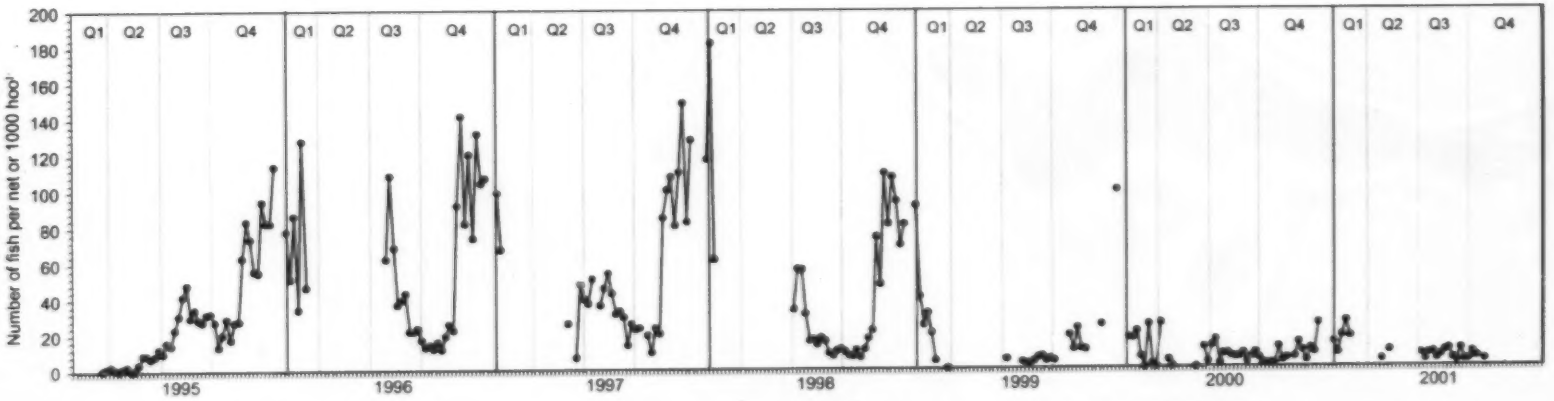


Figure 4. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, 3Ps Gillnet 5 1/2 in..

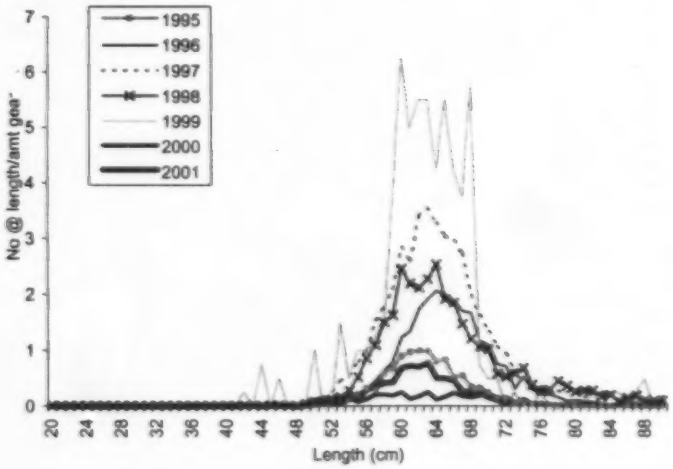
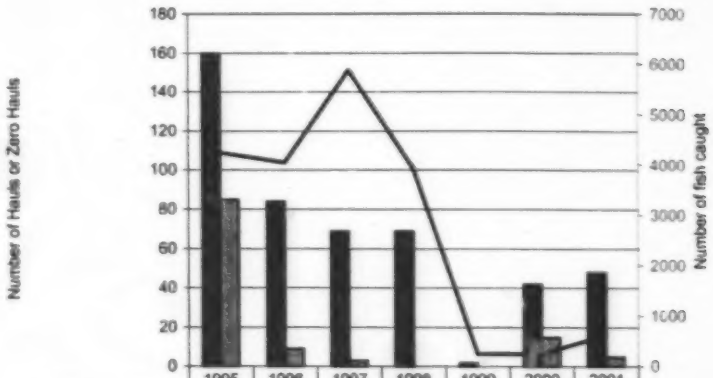


Figure 5. Relative length frequency (number at length / amount of gear) for control and experimental gears, St. Bride's Gillnet 5 1/2 in..



	1995	1996	1997	1998	1999	2000	2001
Sum of Nhauls	160	84	69	69	2	42	48
Sum of Nzero	85	9	3	0	0	15	5
Sum of Nmeas	4229	4046	5876	3910	251	254	622

Figure 6. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, St. Bride's Gillnet 5 1/2 in..

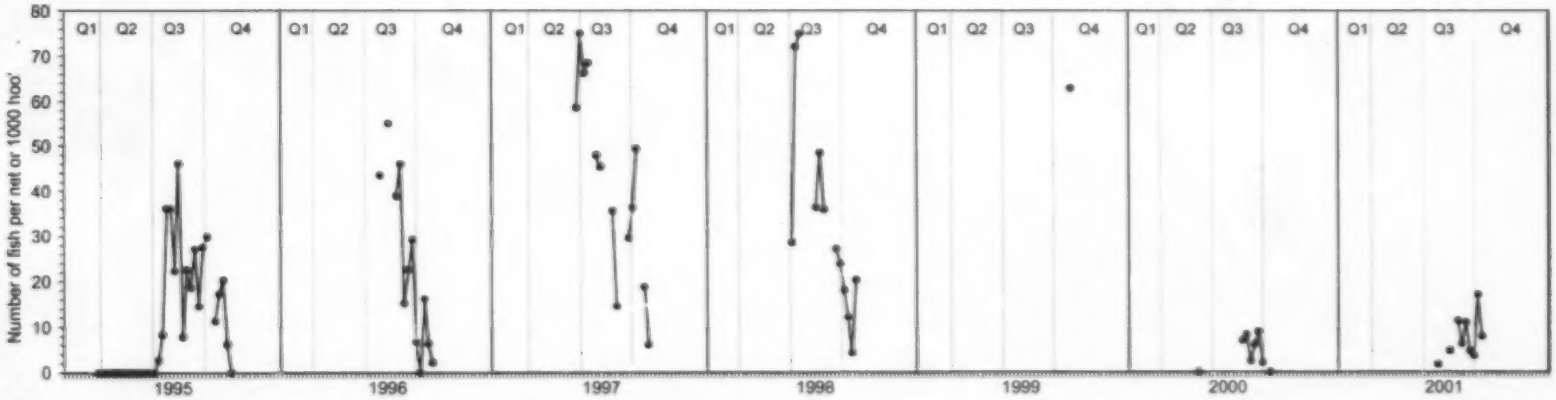


Figure 7. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, St. Bride's Gillnet 5 1/2 in..

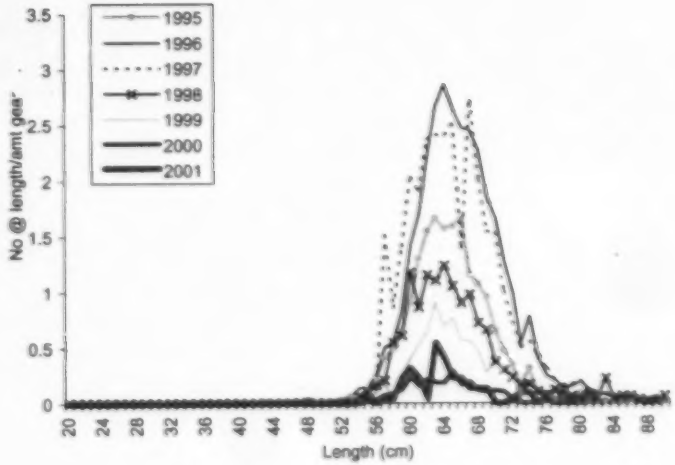
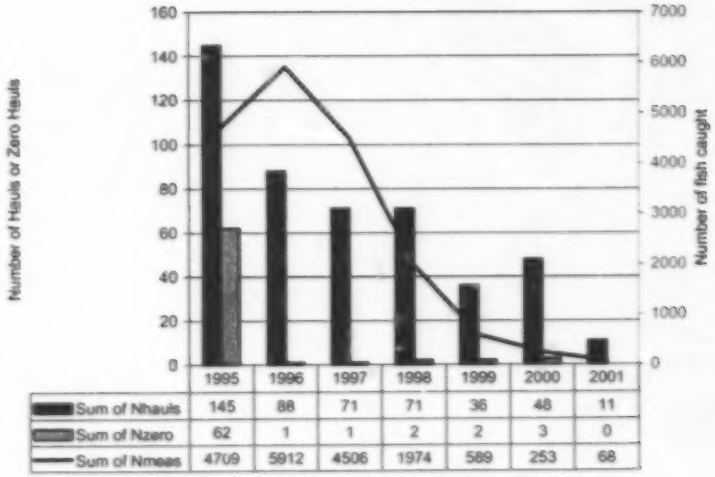


Figure 8. Relative length frequency (number at length / amount of gear) for control and experimental gears, Fox Hr Gillnet 5 1/2 in..



	1995	1996	1997	1998	1999	2000	2001
Sum of Nhauls	145	88	71	71	36	48	11
Sum of Nzero	62	1	1	2	2	3	0
Sum of Nmeas	4709	5912	4506	1974	589	253	68

Figure 9. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Fox Hr Gillnet 5 1/2 in..

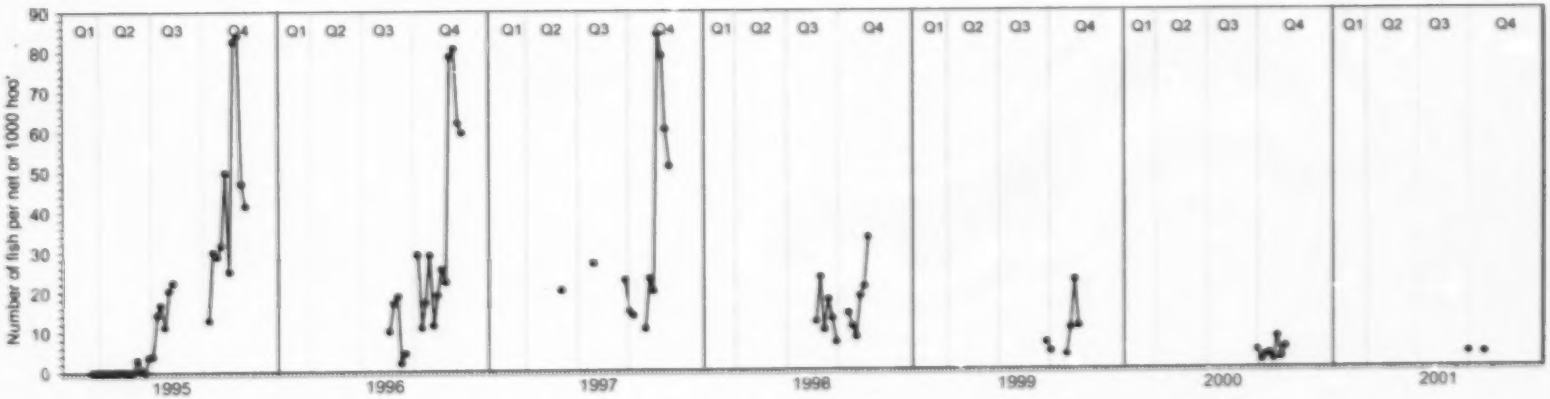


Figure 10. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, Fox Hr Gillnet 5 1/2 in..

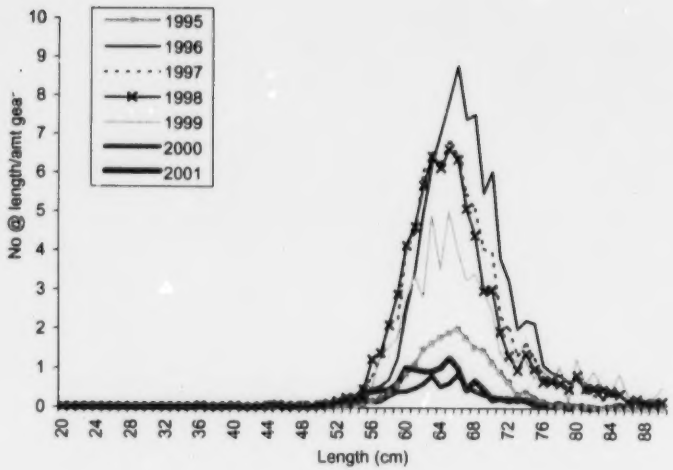
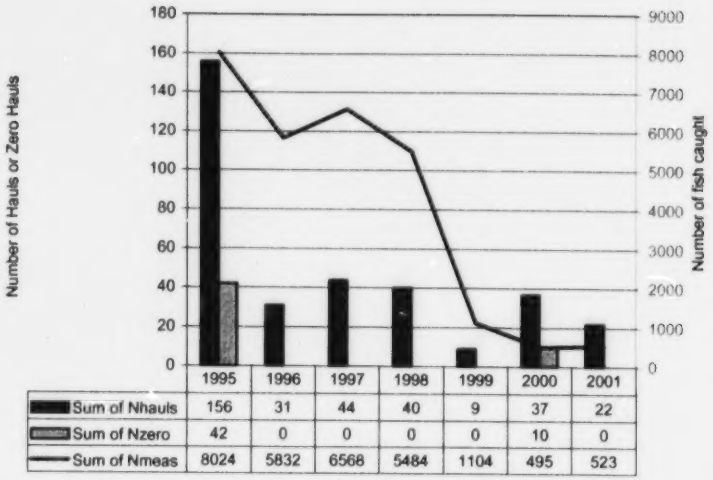


Figure 11. Relative length frequency (number at length / amount of gear) for control and experimental gears, Little Hr East Gillnet 5 1/2 in.



	1995	1996	1997	1998	1999	2000	2001
Sum of Nhauls	156	31	44	40	9	37	22
Sum of Nzero	42	0	0	0	0	10	0
Sum of Nmeas	8024	5832	6568	5484	1104	495	523

Figure 12. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Little Hr East Gillnet 5 1/2 in..

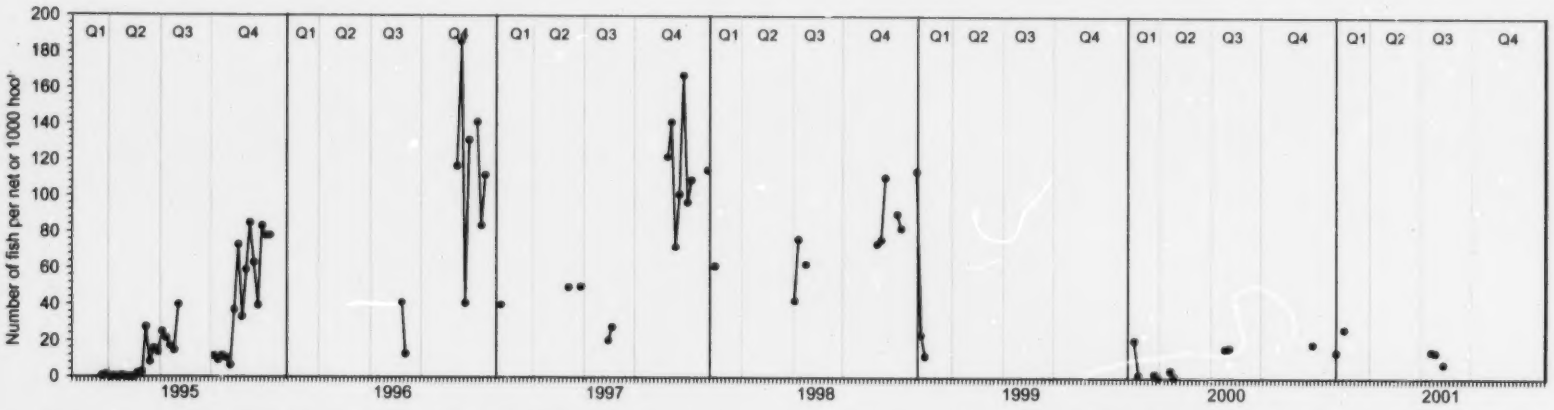


Figure 13. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, Little Hr East Gillnet 5 1/2 in..

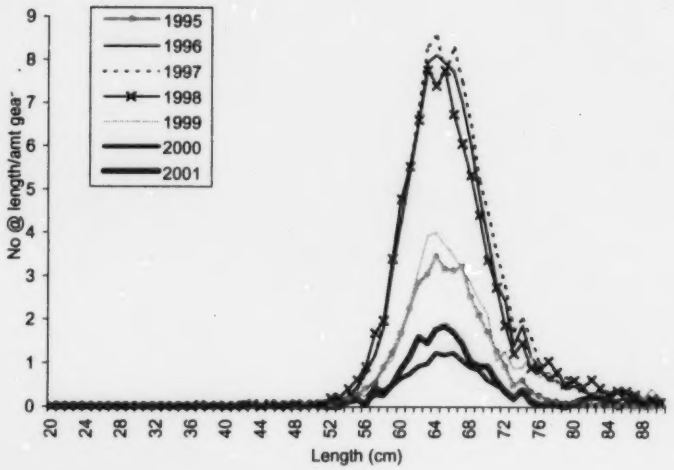
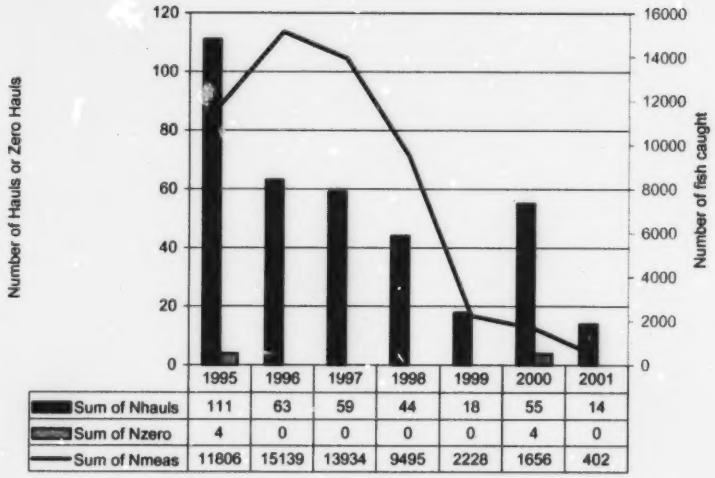


Figure 14. Relative length frequency (number at length / amount of gear) for control and experimental gears, North Hr Gillnet 5 1/2 in..



	1995	1996	1997	1998	1999	2000	2001
Sum of Nhauls	111	63	59	44	18	55	14
Sum of Nzero	4	0	0	0	0	4	0
Sum of Nmeas	11806	15139	13934	9495	2228	1656	402

Figure 15. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, North Hr Gillnet 5 1/2 in..

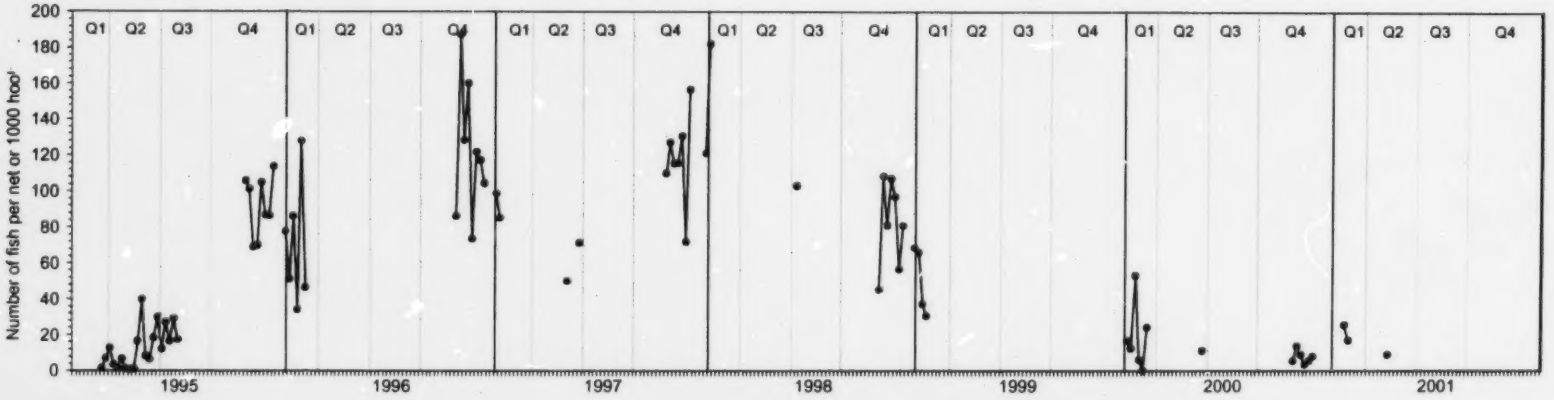


Figure 16. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, North Hr Gillnet 5 1/2 in..

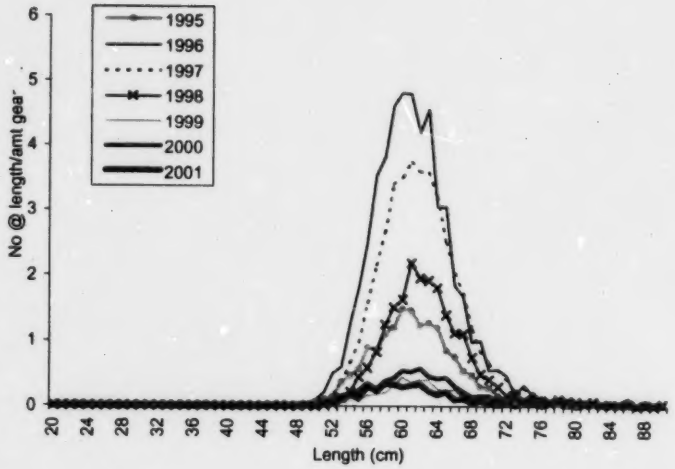
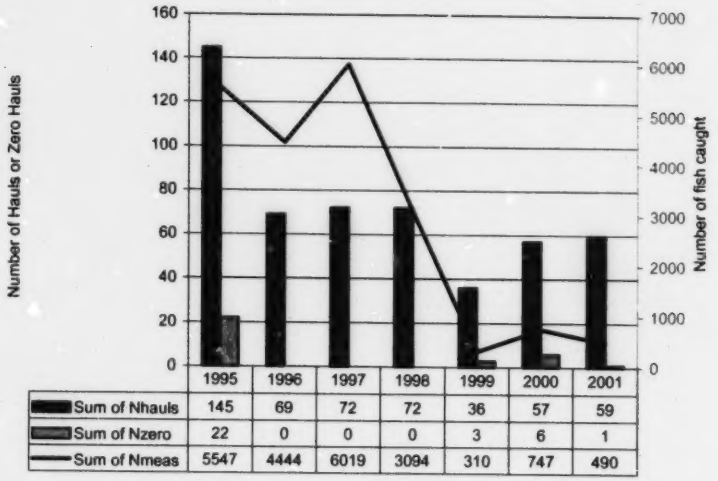


Figure 17. Relative length frequency (number at length / amount of gear) for control and experimental gears, Monkstown Gillnet 5 1/2 in..



	1995	1996	1997	1998	1999	2000	2001
Sum of Nhauls	145	69	72	72	36	57	59
Sum of Nzero	22	0	0	0	3	6	1
Sum of Nmeas	5547	4444	6019	3094	310	747	490

Figure 18. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Monkstown Gillnet 5 1/2 in..

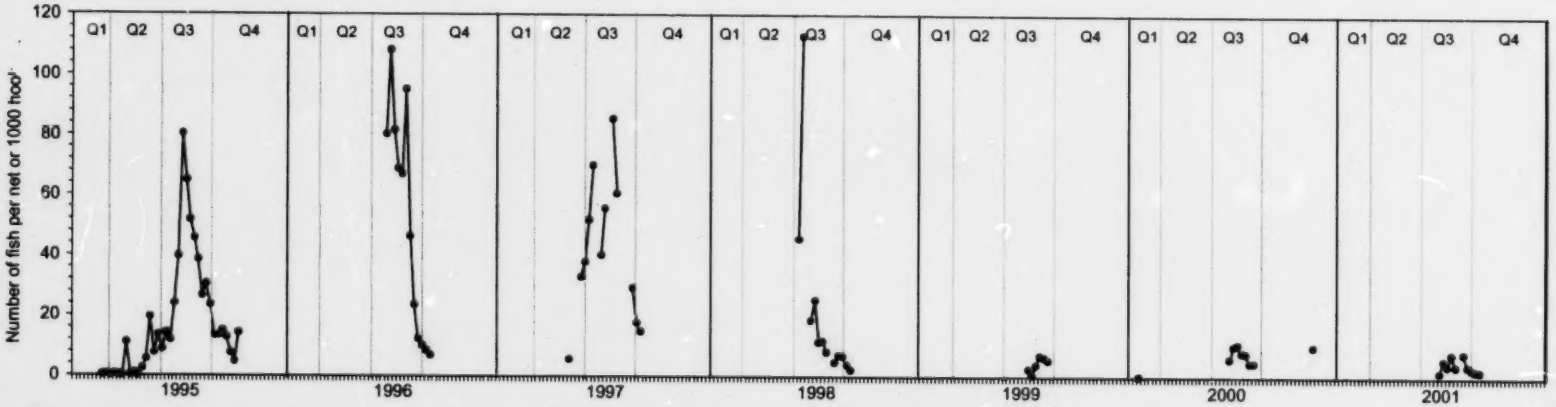


Figure 19. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, Monkstown Gillnet 5 1/2 in..

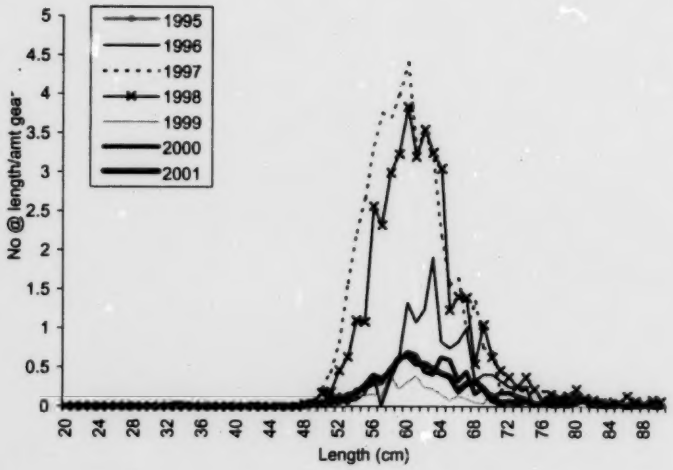
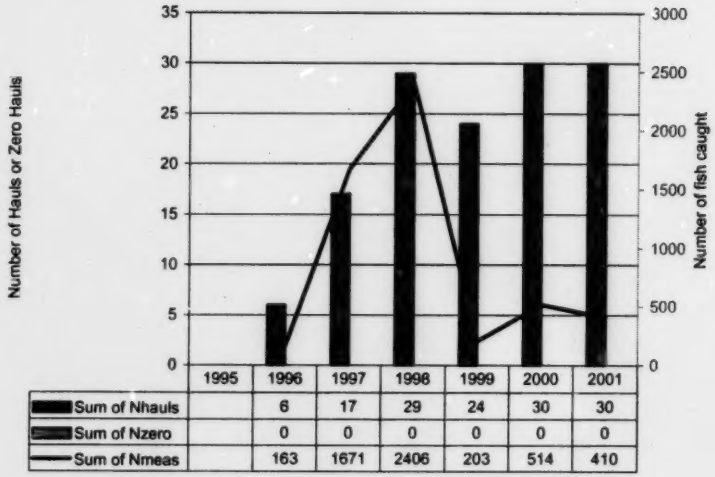


Figure 20. Relative length frequency (number at length / amount of gear) for control and experimental gears, Little Paradise Gillnet 5 1/2 i



	1995	1996	1997	1998	1999	2000	2001
Sum of Nhauls		6	17	29	24	30	30
Sum of Nzero		0	0	0	0	0	0
Sum of Nmeas		163	1671	2406	203	514	410

Figure 21. Number of hauls (Nhauls), number of zero catch hauls (Nzero), and total number of fish caught (Nmeas), for control and experimental gears, Little Paradise Gillnet 5 1/2 in..

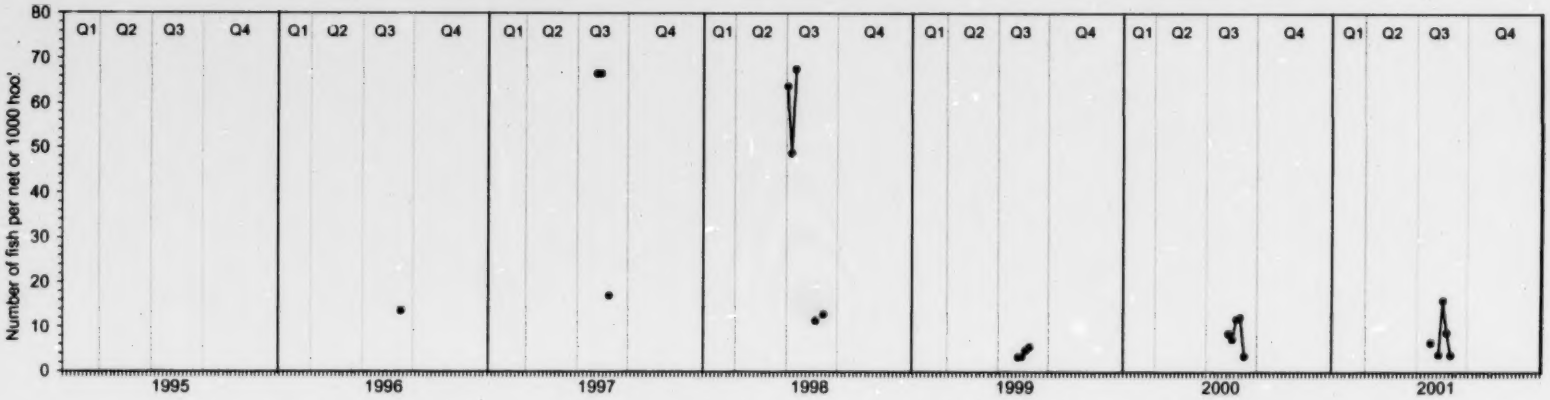


Figure 22. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, Little Paradise Gillnet 5 1/2 in..

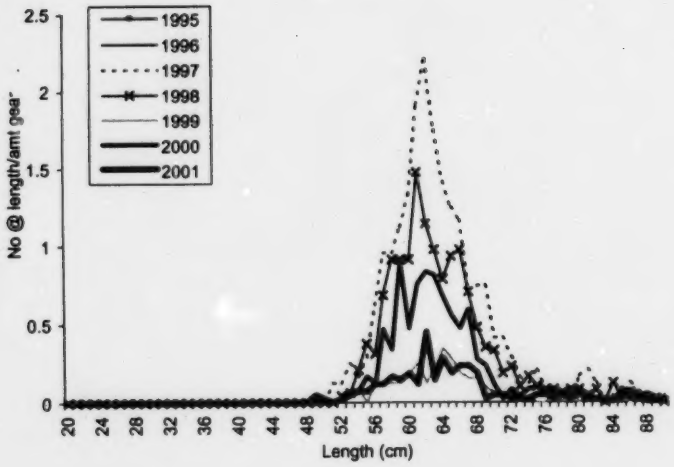
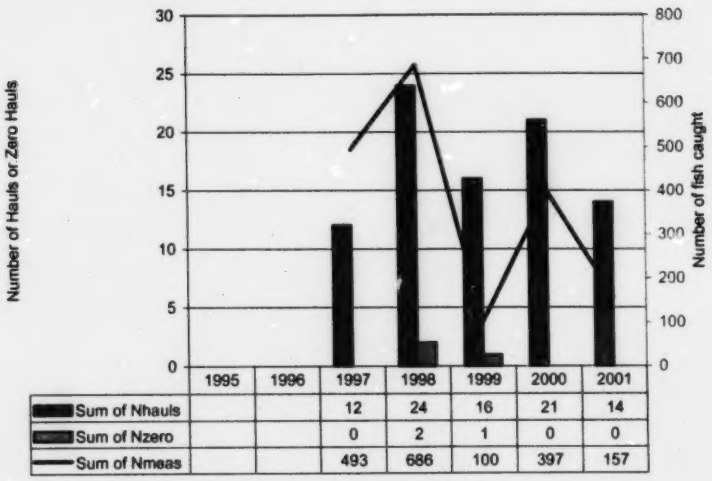


Figure 23. Relative length frequency (number at length / amount of gear) for control and experimental gears, Red Hr Gillnet 5 1/2 in..



	1995	1996	1997	1998	1999	2000	2001
Sum of Nhauls			12	24	16	21	14
Sum of Nzero			0	2	1	0	0
Sum of Nmeas			493	686	100	397	157

Figure 24. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Red Hr Gillnet 5 1/2 in..

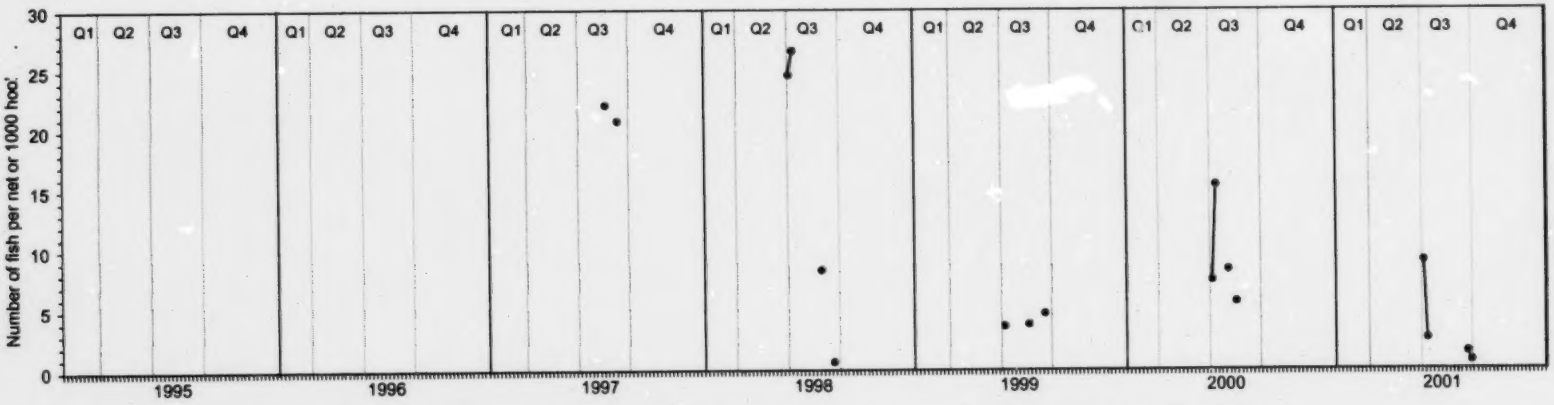


Figure 25. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, Red Hr Gillnet 5 1/2 in..

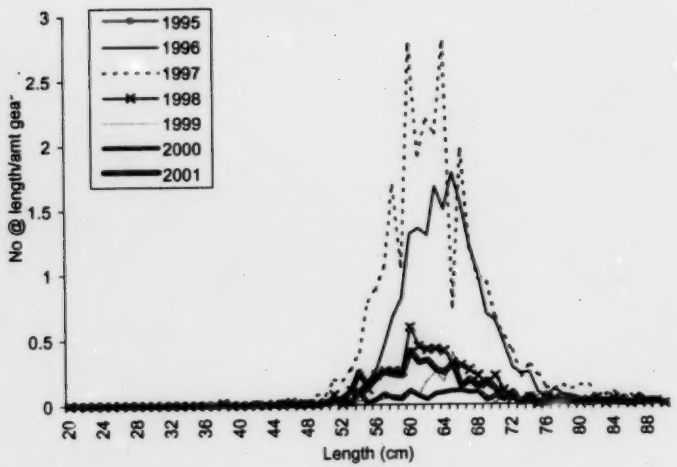
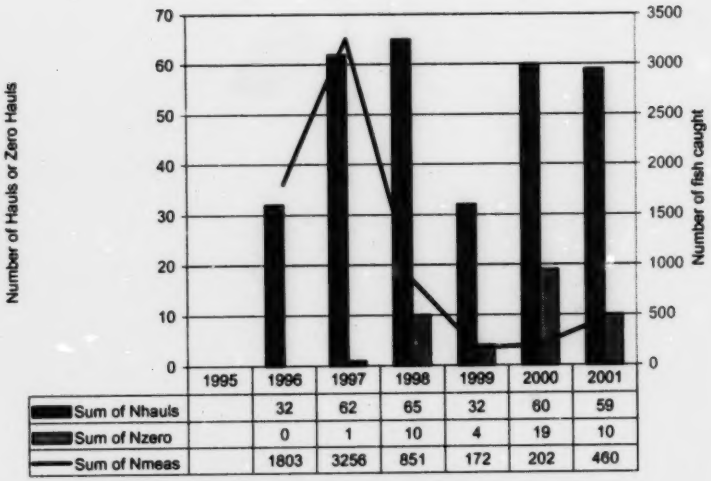


Figure 26. Relative length frequency (number at length / amount of gear) for control and experimental gears, Lawn Gillnet 5 1/2 in..



	1995	1996	1997	1998	1999	2000	2001
Sum of Nhauls		32	62	65	32	60	59
Sum of Nzero		0	1	10	4	19	10
Sum of Nmeas		1803	3256	851	172	202	460

Figure 27. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Lawn Gillnet 5 1/2 in..

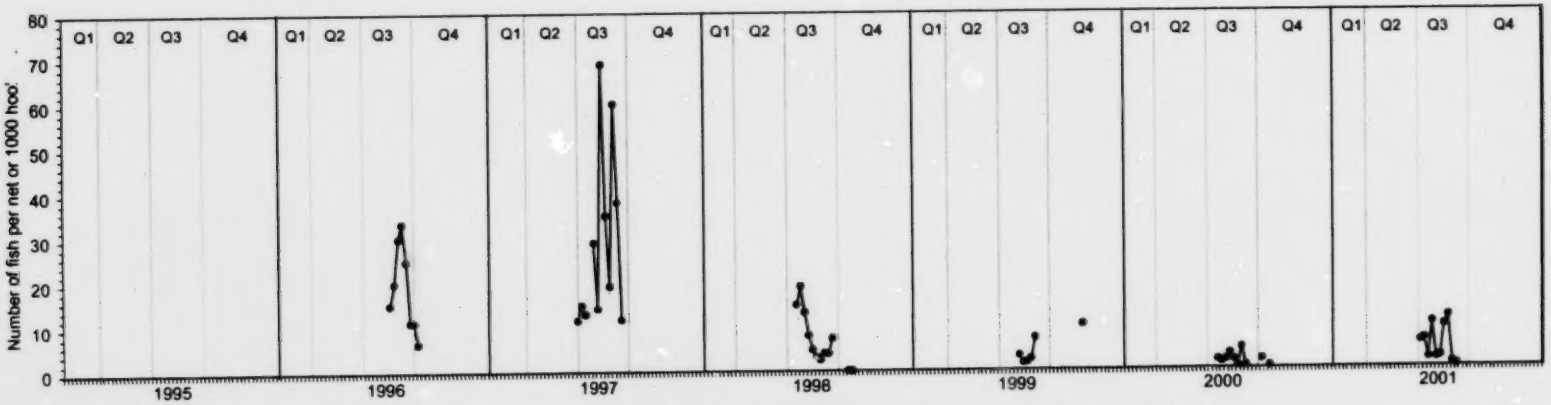


Figure 28. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, Lawn Gillnet 5 1/2 in..

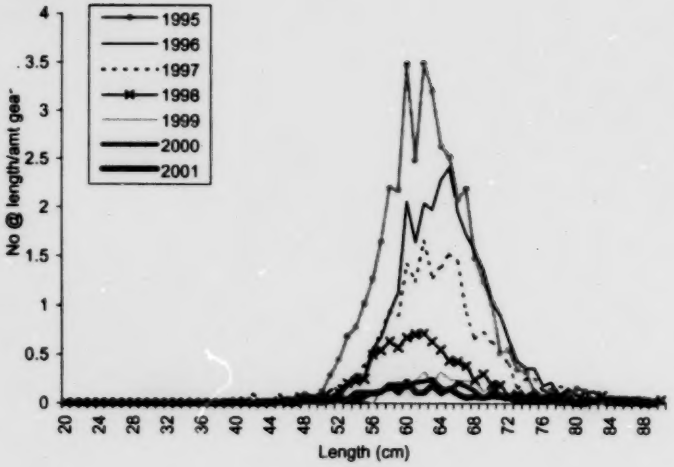
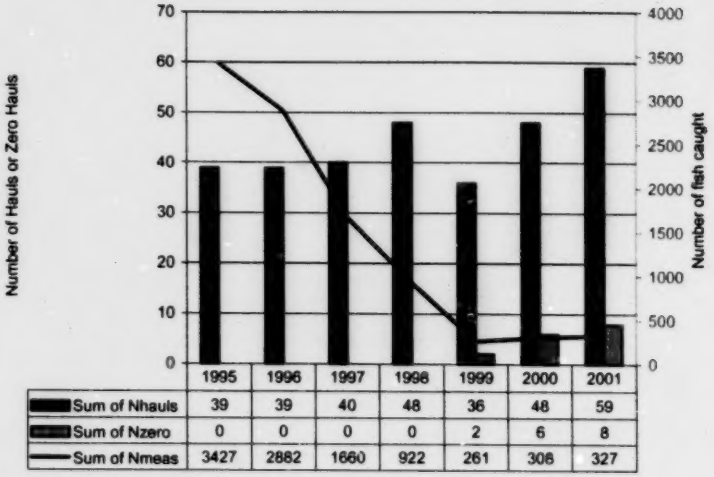


Figure 29. Relative length frequency (number at length / amount of gear) for control and experimental gears, Lord's Cove Gillnet 5 1/2 in..



	1995	1996	1997	1998	1999	2000	2001
Sum of Nhauls	39	39	40	48	36	48	59
Sum of Nzero	0	0	0	0	2	6	8
Sum of Nmeas	3427	2882	1660	922	261	308	327

Figure 30. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Lord's Cove Gillnet 5 1/2 in..

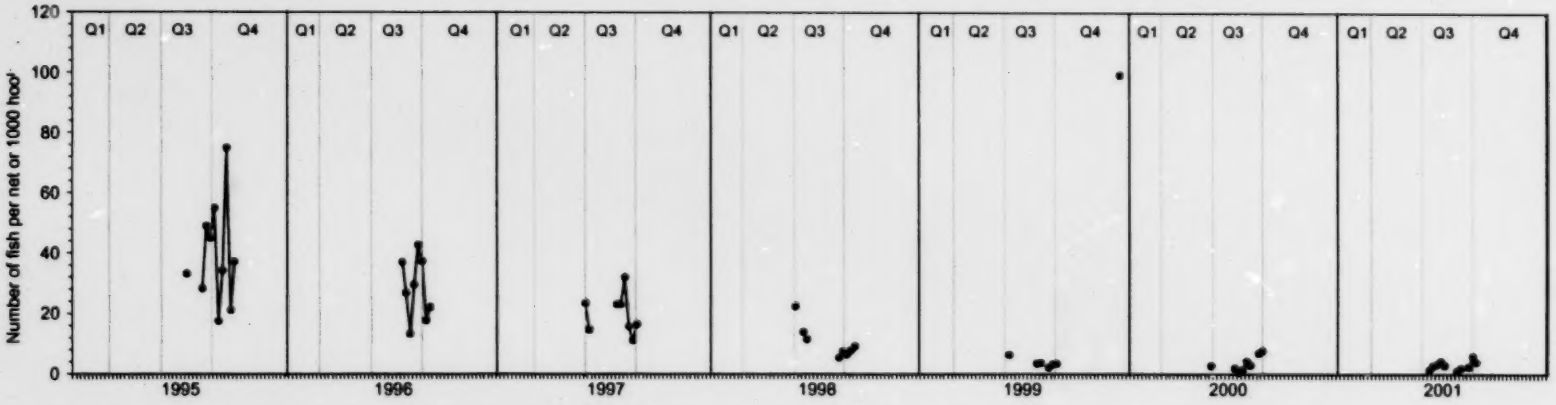


Figure 31. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, Lord's Cove Gillnet 5 1/2 in..

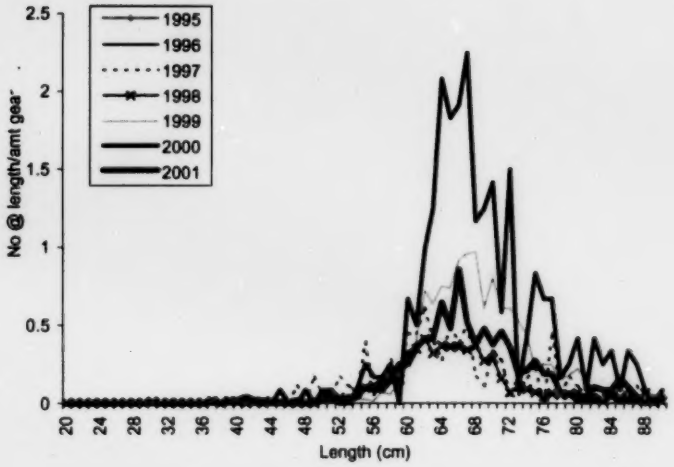
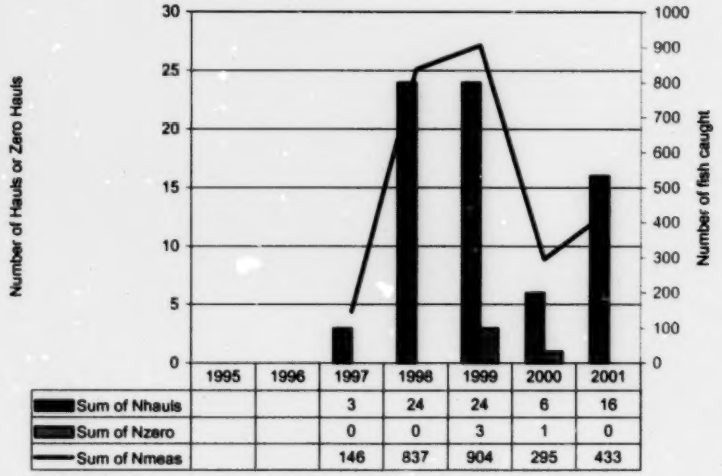


Figure 32. Relative length frequency (number at length / amount of gear) for control and experimental gears, Seal Cove Gillnet 5 1/2 in..



	1995	1996	1997	1998	1999	2000	2001
Sum of Nhauls			3	24	24	6	16
Sum of Nzero			0	0	3	1	0
Sum of Nmeas			146	837	904	295	433

Figure 33. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Seal Cove Gillnet 5 1/2 in..

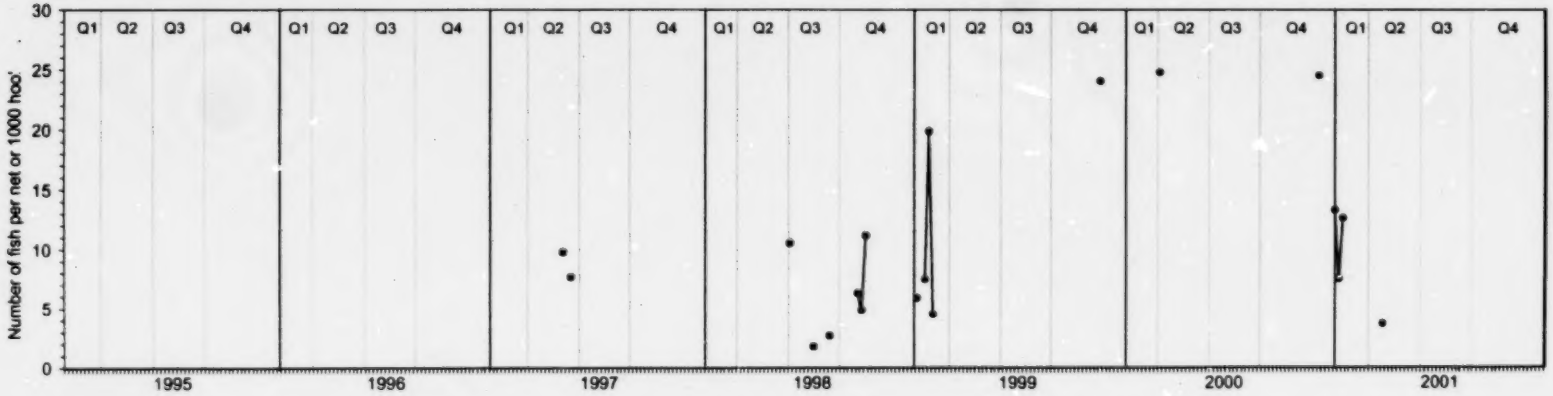


Figure 34. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, Seal Cove Gillnet 5 1/2 in..

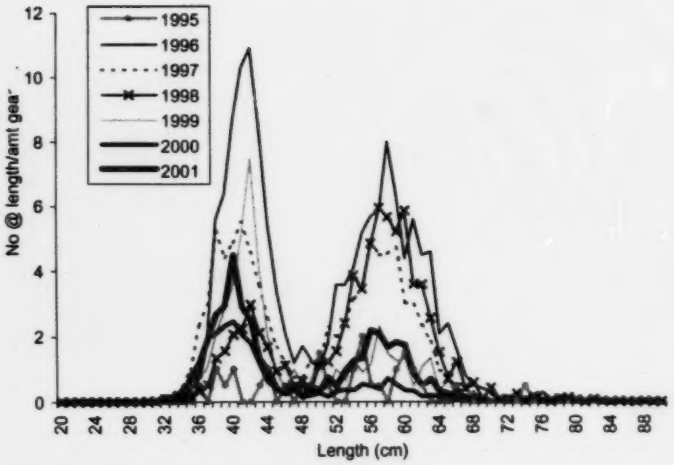
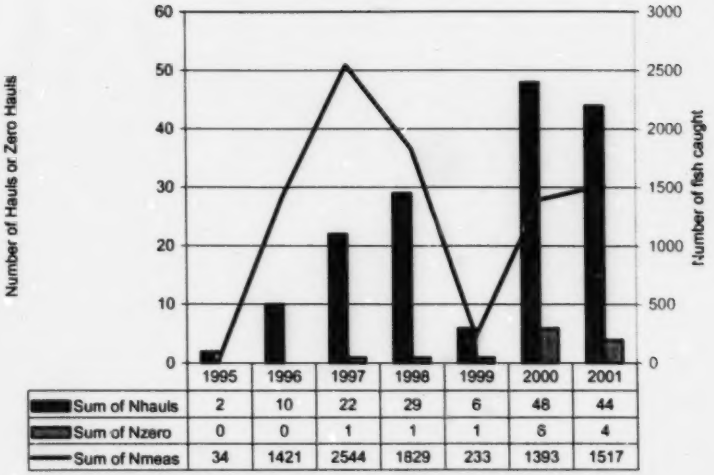


Figure 35. Relative length frequency (number at length / amount of gear) for control and experimental gears, 3Ps Gillnet 3 1/4 in..



	1995	1996	1997	1998	1999	2000	2001
Sum of Nhauls	2	10	22	29	6	48	44
Sum of Nzero	0	0	1	1	1	6	4
Sum of Nmeas	34	1421	2544	1829	233	1393	1517

Figure 36. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, 3Ps Gillnet 3 1/4 in..

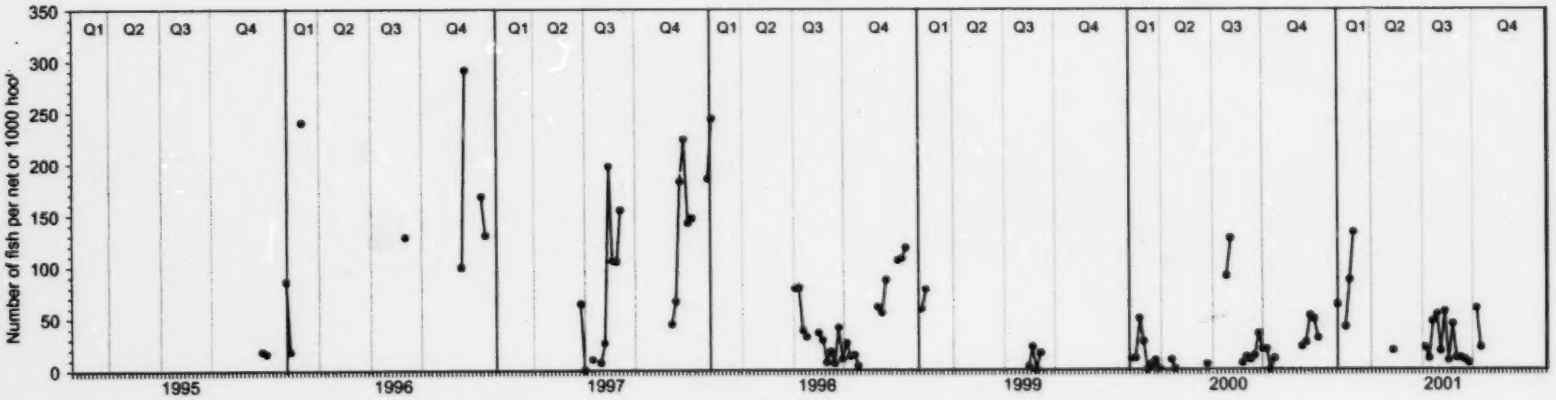


Figure 37. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, 3Ps Gillnet 3 1/4 in..

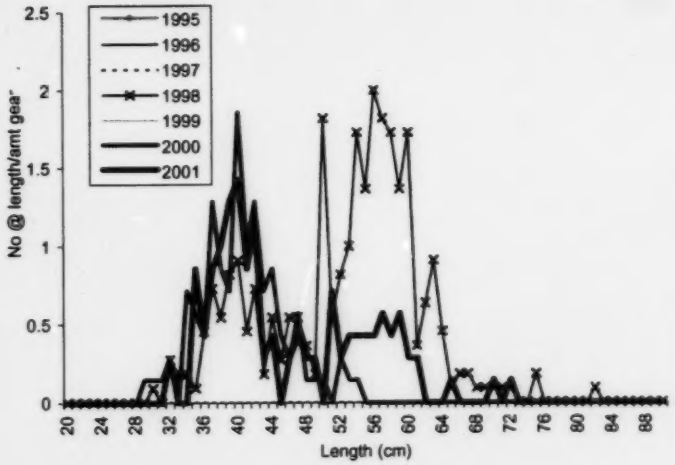
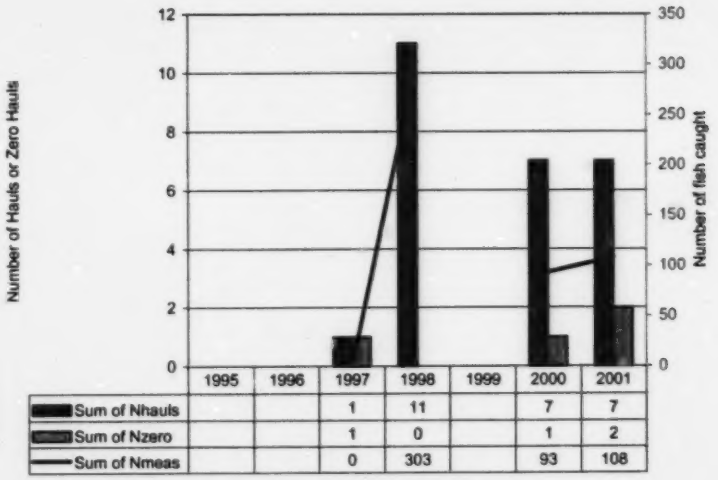


Figure 38. Relative length frequency (number at length / amount of gear) for control and experimental gears, St. Bride's Gillnet 3 1/4 in..



	1995	1996	1997	1998	1999	2000	2001
Sum of Nhauls			1	11		7	7
Sum of Nzero			1	0		1	2
Sum of Nmeas			0	303		93	108

Figure 39. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, St. Bride's Gillnet 3 1/4 in..

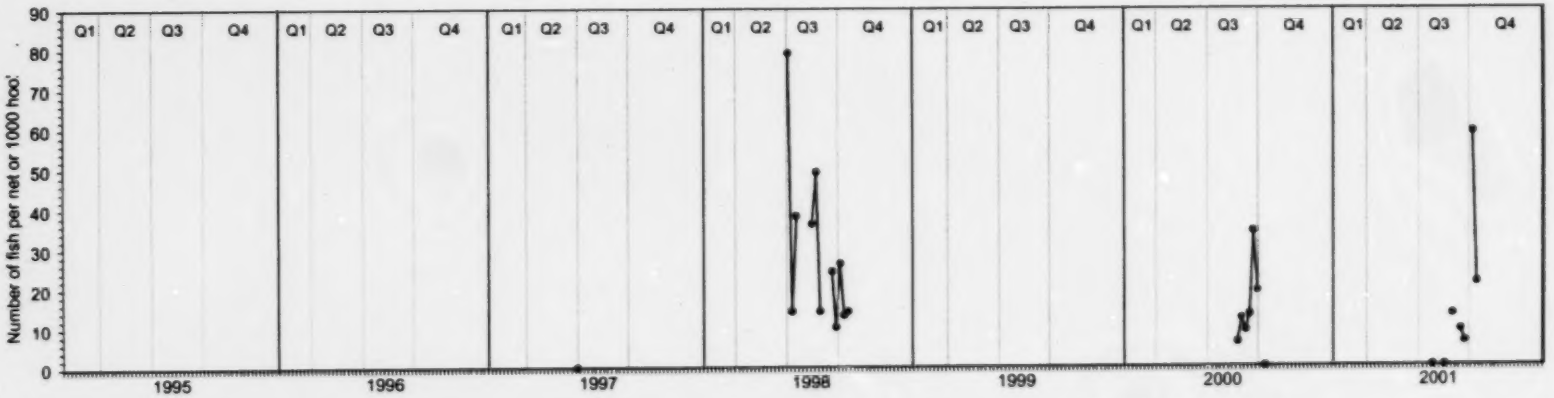


Figure 40. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, St. Bride's Gillnet 3 1/4 in..

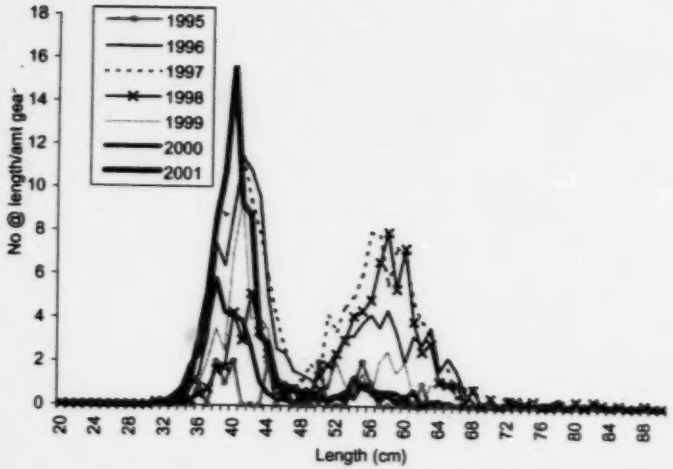
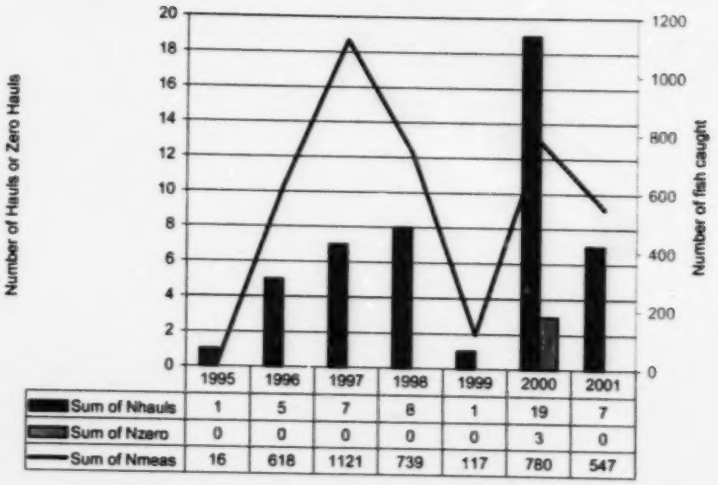


Figure 41. Relative length frequency (number at length / amount of gear) for control and experimental gears, Little Hr East Gillnet 3 1/4 in.



	1995	1996	1997	1998	1999	2000	2001
Sum of Nhauls	1	5	7	8	1	19	7
Sum of Nzero	0	0	0	0	0	3	0
Sum of Nmeas	16	618	1121	739	117	780	547

Figure 42. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Little Hr East Gillnet 3 1/4 in..

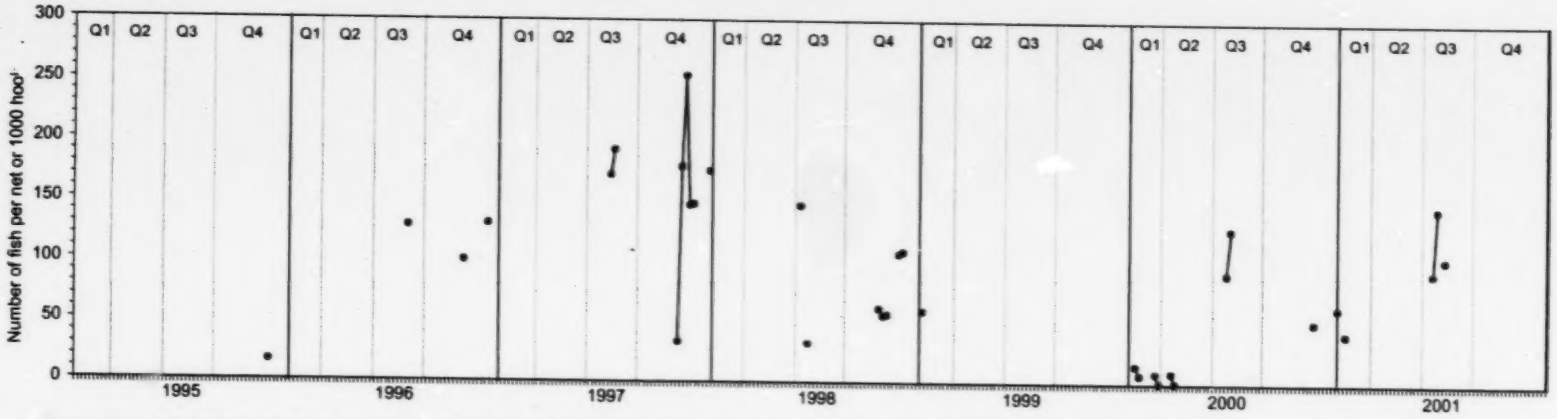


Figure 43. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, Little Hr East Gillnet 3 1/4 in..

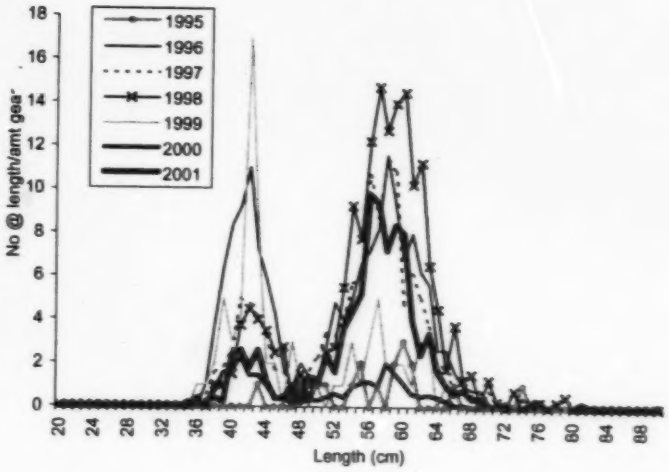
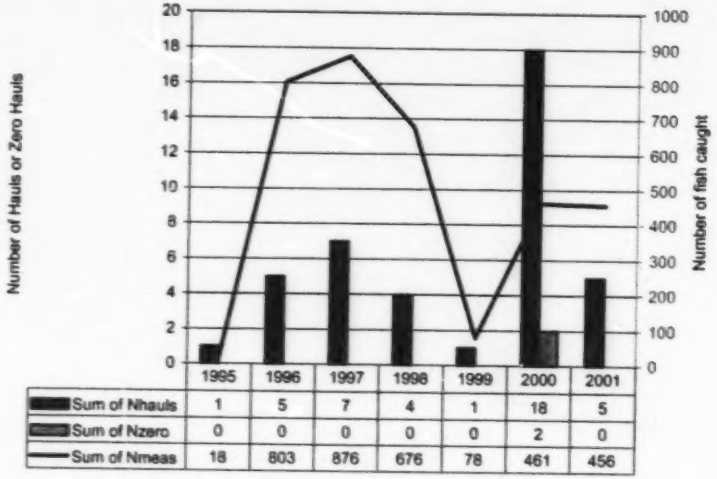


Figure 44. Relative length frequency (number at length / amount of gear) for control and experimental gears, North Hr Gillnet 3 1/4 in..



	1995	1996	1997	1998	1999	2000	2001
Sum of Nhauls	1	5	7	4	1	18	5
Sum of Nzero	0	0	0	0	0	2	0
Sum of Nmeas	18	803	876	676	78	461	456

Figure 45. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, North Hr Gillnet 3 1/4 in..

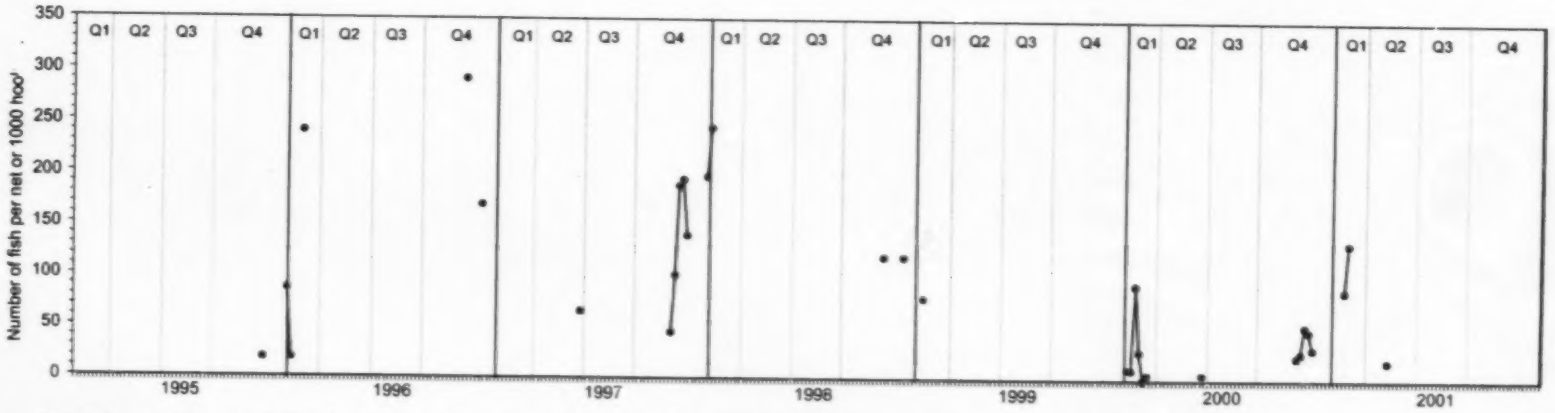


Figure 46. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, North Hr Gillnet 3 1/4 in..

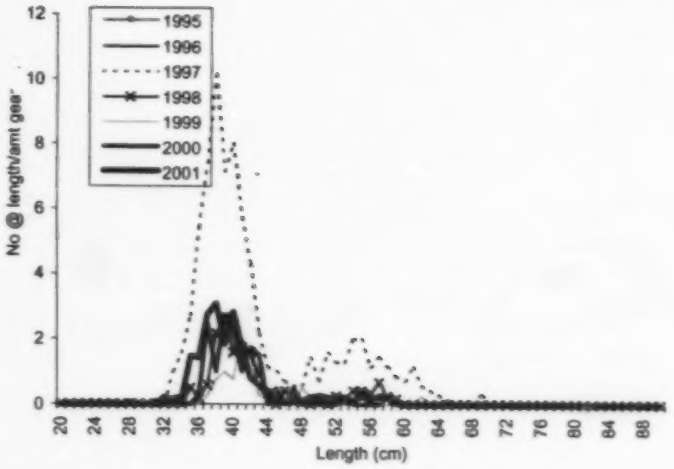
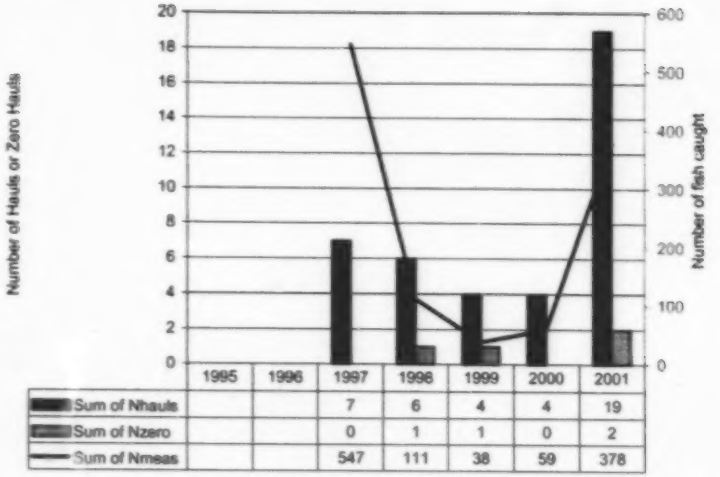


Figure 47. Relative length frequency (number at length / amount of gear) for control and experimental gears, Lawn Gillnet 3 1/4 in..



	1995	1996	1997	1998	1999	2000	2001
Sum of Nhauls			7	6	4	4	19
Sum of Nzero			0	1	1	0	2
Sum of Nmeas			547	111	38	59	378

Figure 48. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Lawn Gillnet 3 1/4 in..

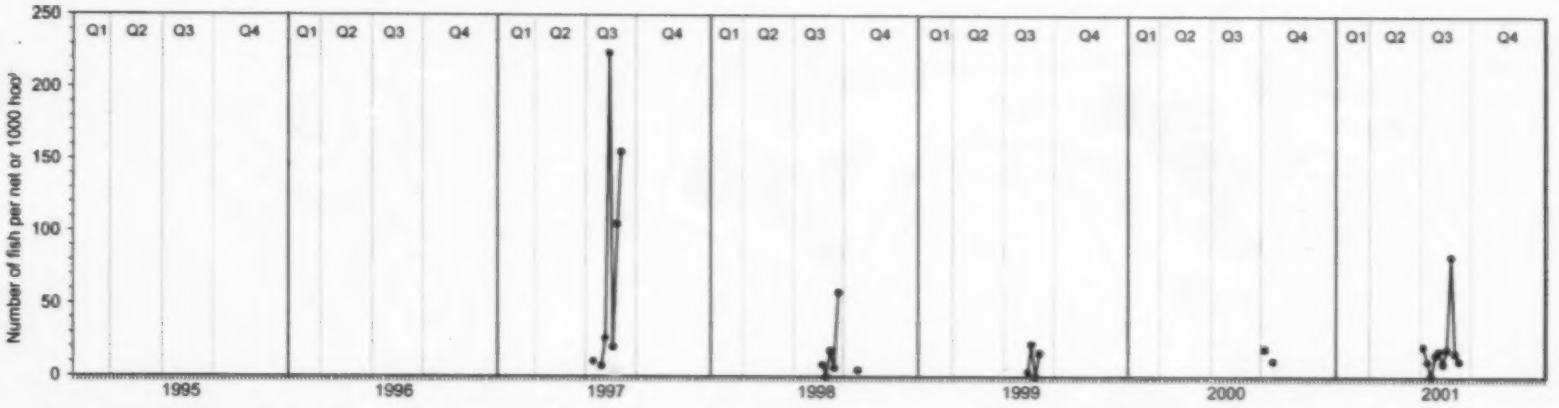


Figure 49. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, Lawn Gillnet 3 1/4 in..

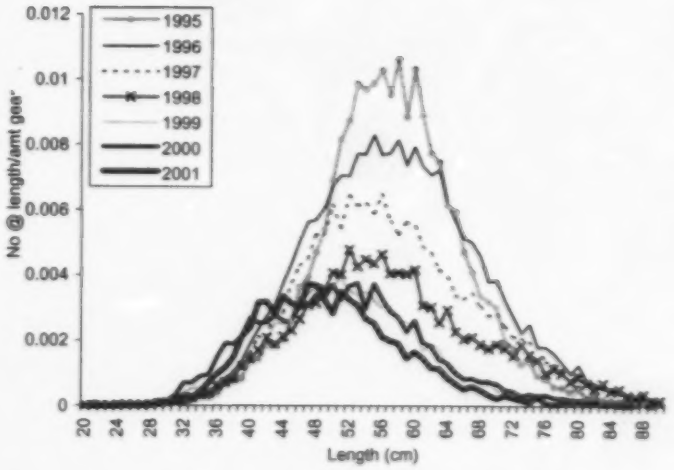
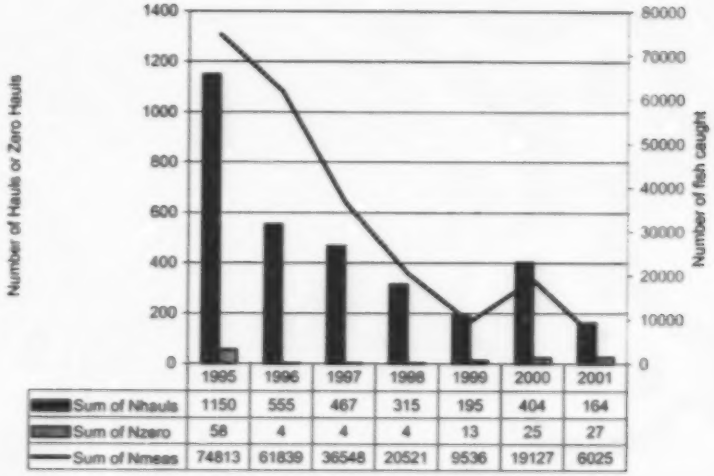


Figure 50. Relative length frequency (number at length / amount of gear) for control and experimental gears, 3Ps Linetrawl .



	1995	1996	1997	1998	1999	2000	2001
Sum of Nhauls	1150	555	467	315	195	404	164
Sum of Nzero	58	4	4	4	13	25	27
Sum of Nmeas	74813	61839	36548	20521	9536	19127	6025

Figure 51. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, 3Ps Linetrawl .

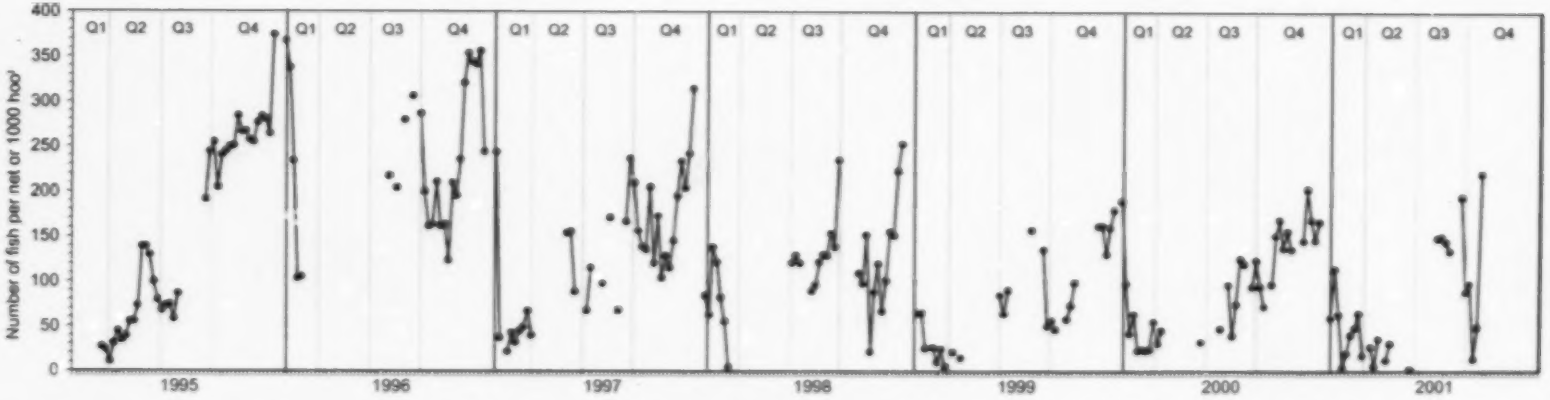


Figure 52. Catch per unit effort (in numbers of fish per 1000 hooks) for all sets (control and experimental) averaged for each week, 3Ps Linetrawl .

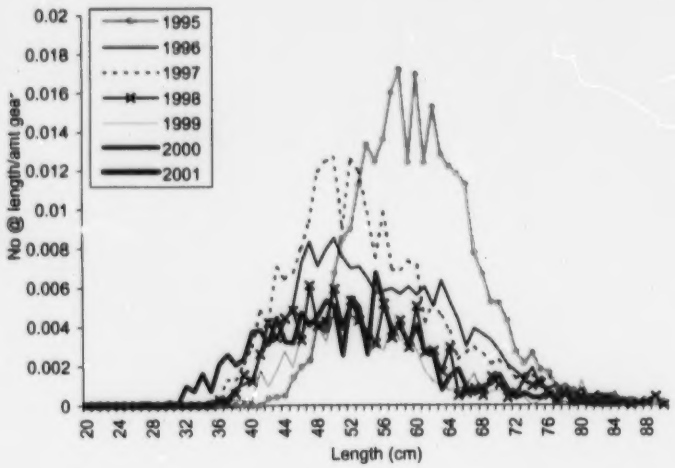
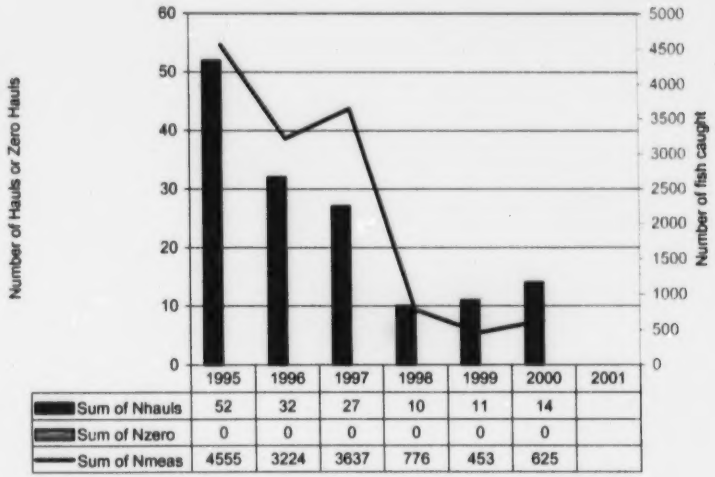


Figure 53. Relative length frequency (number at length / amount of gear) for control and experimental gears, Little Paradise Linetrawl .



	1995	1996	1997	1998	1999	2000	2001
Sum of Nhauls	52	32	27	10	11	14	
Sum of Nzero	0	0	0	0	0	0	
Sum of Nmeas	4555	3224	3637	776	453	625	

Figure 54. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Little Paradise Linetrawl .

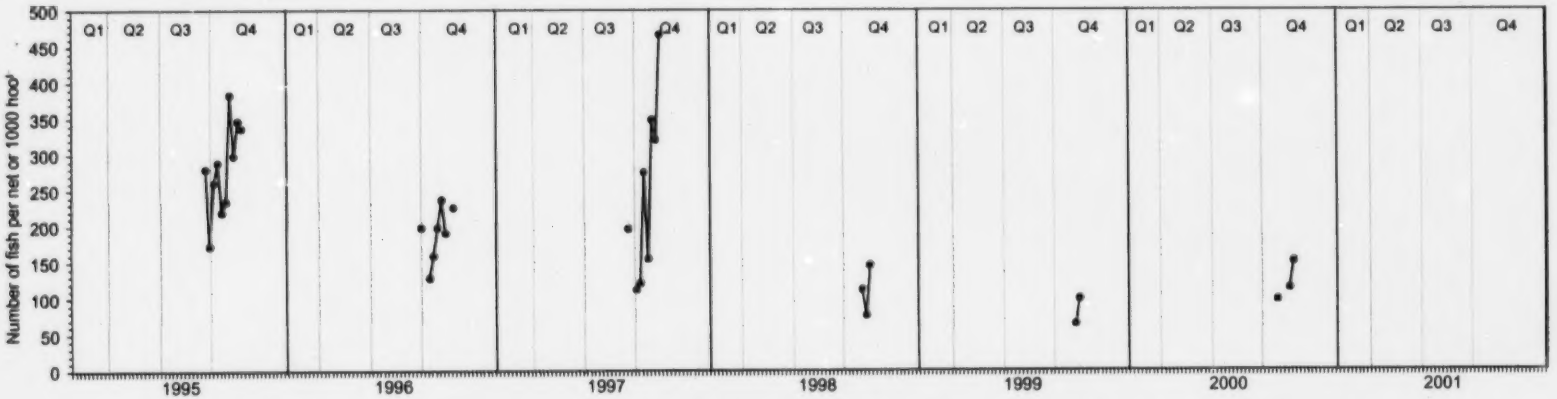


Figure 55. Catch per unit effort (in numbers of fish per 1000 hooks) for all sets (control and experimental) averaged for each week, Little Paradise Linetrawl .

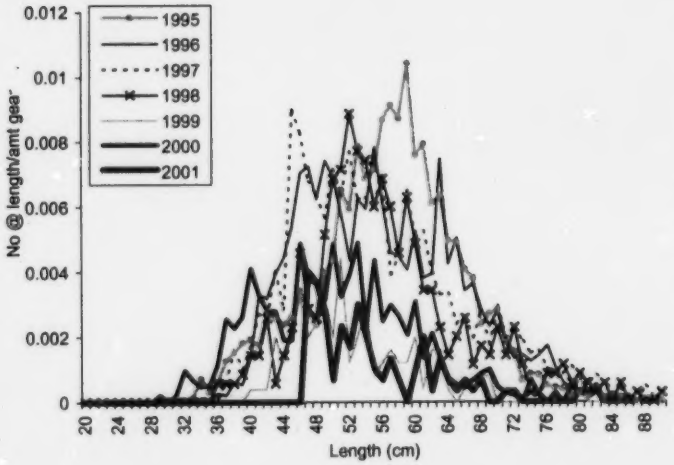
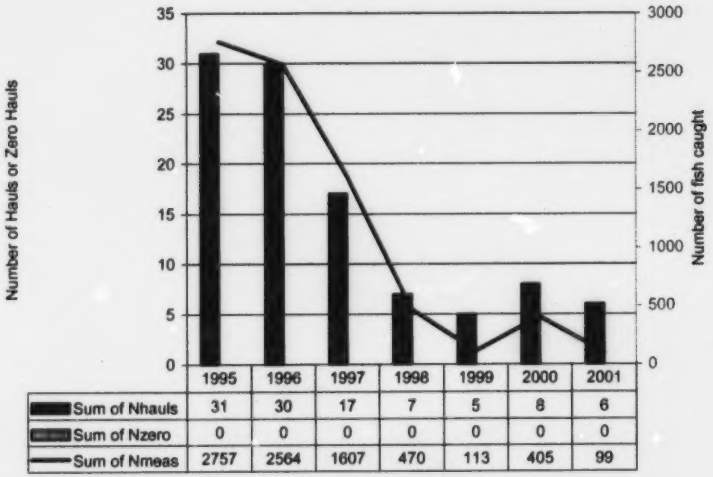


Figure 56. Relative length frequency (number at length / amount of gear) for control and experimental gears, Red Hr Linetrawl .



	1995	1996	1997	1998	1999	2000	2001
Sum of Nhauls	31	30	17	7	5	8	6
Sum of Nzero	0	0	0	0	0	0	0
Sum of Nmeas	2757	2564	1607	470	113	405	99

Figure 57. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Red Hr Linetrawl .

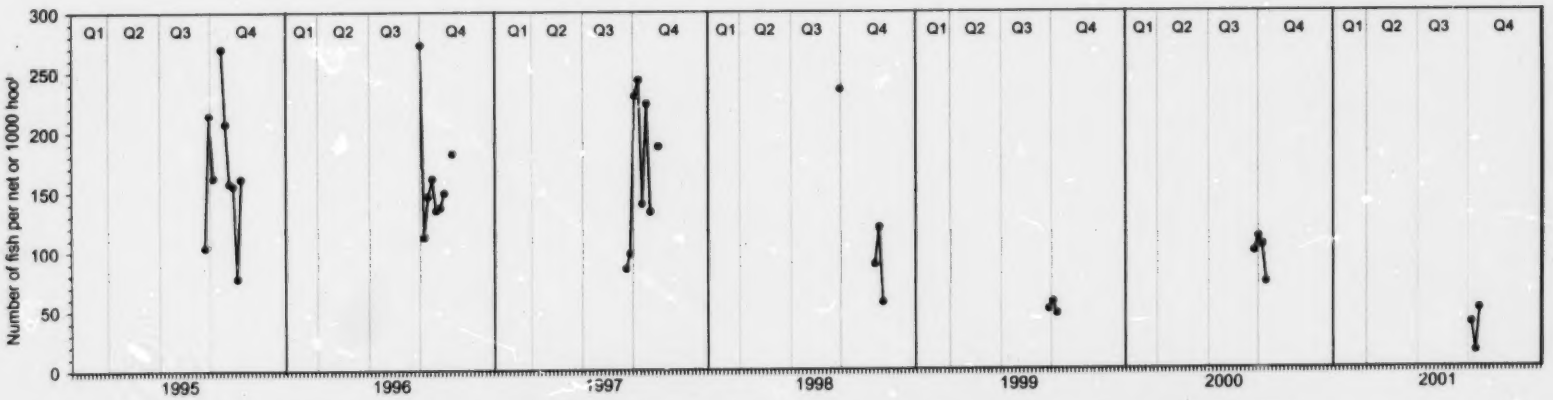


Figure 58. Catch per unit effort (in numbers of fish per 1000 hooks) for all sets (control and experimental) averaged for each week, Red Hr Linetrawl .

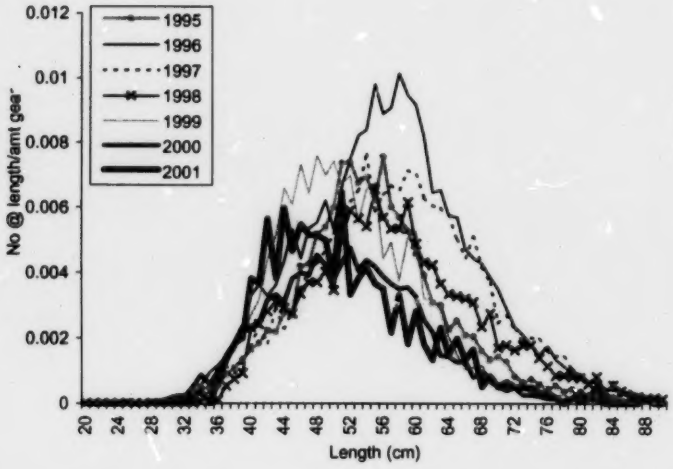
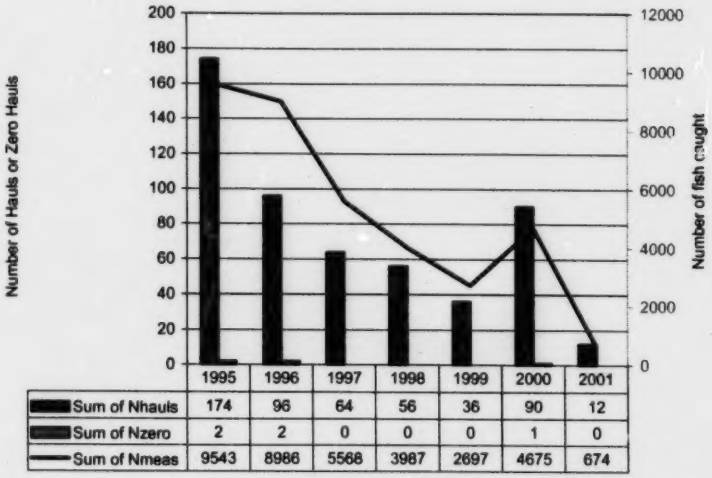


Figure 59. Relative length frequency (number at length / amount of gear) for control and experimental gears, Rencontre East Linetrawl .



	1995	1996	1997	1998	1999	2000	2001
Sum of Nhauls	174	96	64	56	36	90	12
Sum of Nzero	2	2	0	0	0	1	0
Sum of Nmeas	9543	8986	5568	3987	2697	4675	674

Figure 60. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Rencontre East Linetrawl .

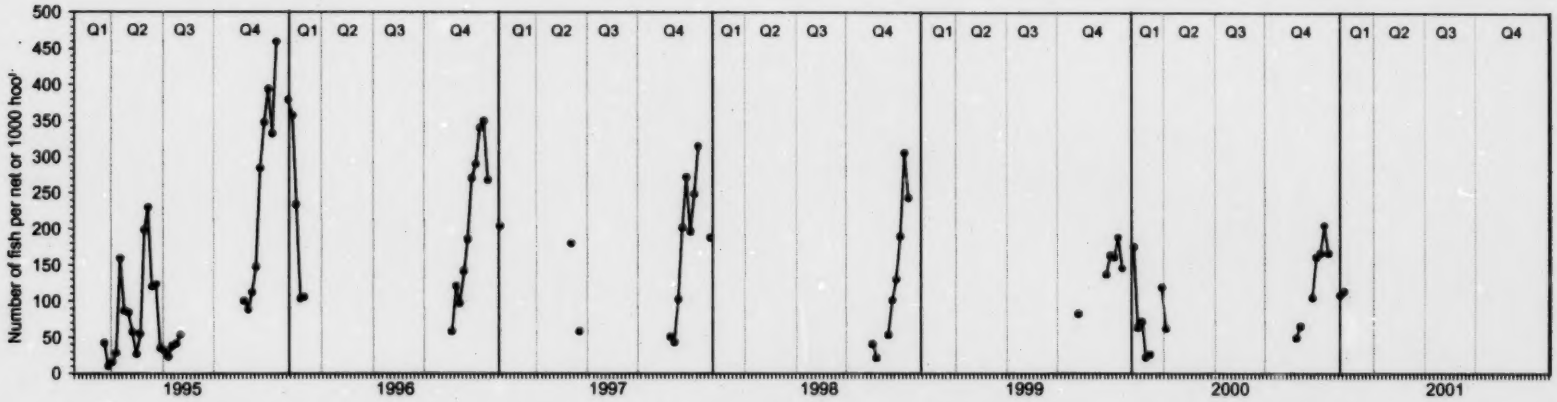


Figure 61. Catch per unit effort (in numbers of fish per 1000 hooks) for all sets (control and experimental) averaged for each week, Rencontre East Linetrawl .

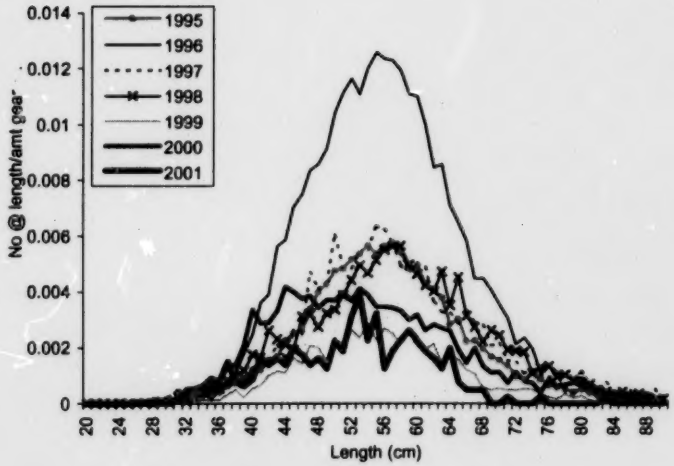
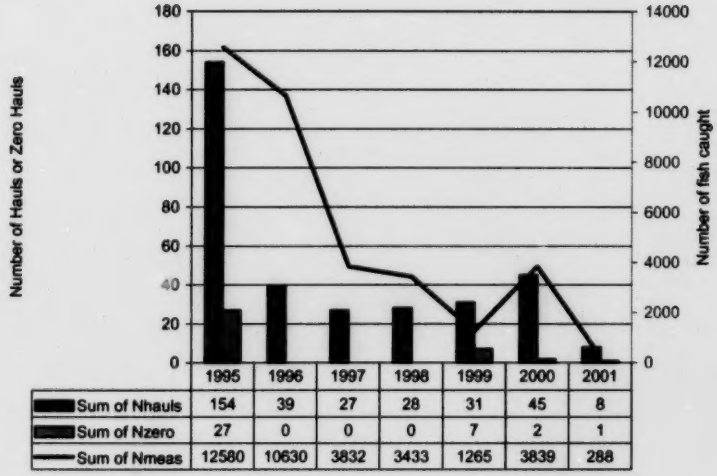


Figure 62. Relative length frequency (number at length / amount of gear) for control and experimental gears, Hr Breton Linetrawl .



	1995	1996	1997	1998	1999	2000	2001
Sum of Nhauls	154	39	27	28	31	45	8
Sum of Nzero	27	0	0	0	7	2	1
Sum of Nmeas	12580	10630	3832	3433	1265	3839	288

Figure 63. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Hr Breton Linetrawl .

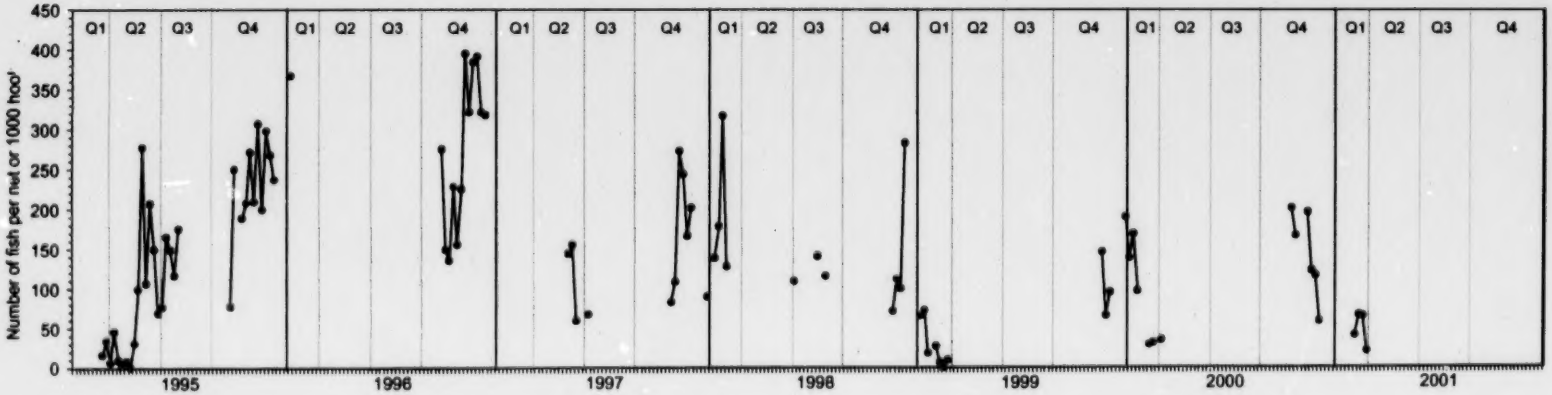


Figure 64. Catch per unit effort (in numbers of fish per 1000 hooks) for all sets (control and experimental) averaged for each week, Hr Breton Linetrawl .

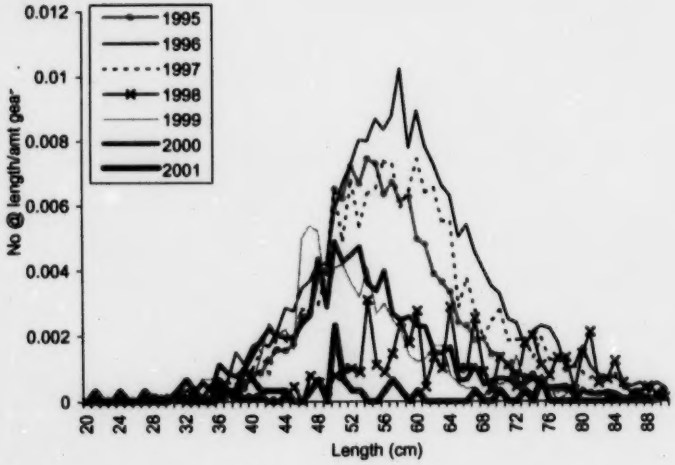
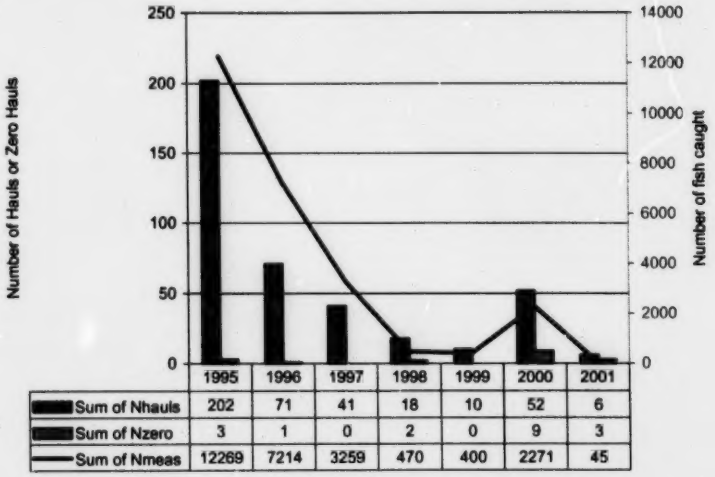


Figure 65. Relative length frequency (number at length / amount of gear) for control and experimental gears, Seal Cove Linetrawl .



	1995	1996	1997	1998	1999	2000	2001
Sum of Nhauls	202	71	41	18	10	52	6
Sum of Nzero	3	1	0	2	0	9	3
Sum of Nmeas	12269	7214	3259	470	400	2271	45

Figure 66. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Seal Cove Linetrawl .

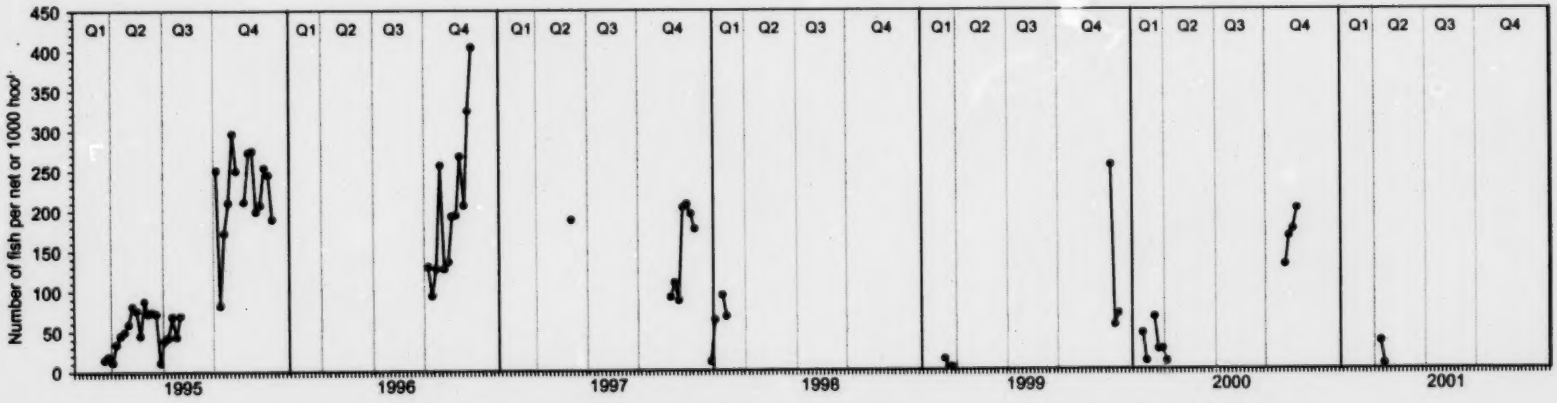


Figure 67. Catch per unit effort (in numbers of fish per 1000 hooks) for all sets (control and experimental) averaged for each week, Seal Cove Linetrawl .

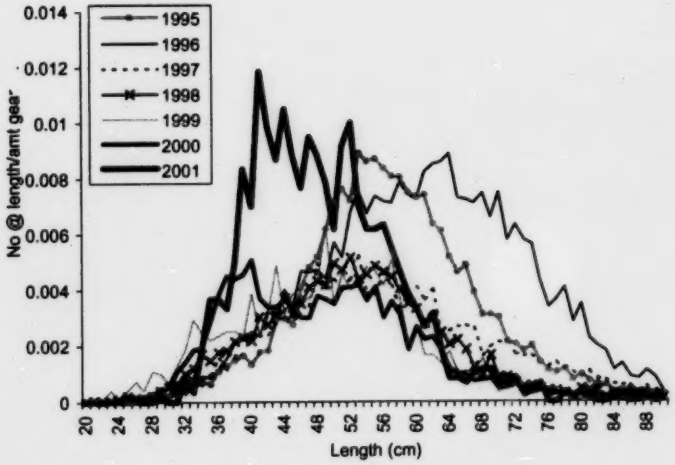
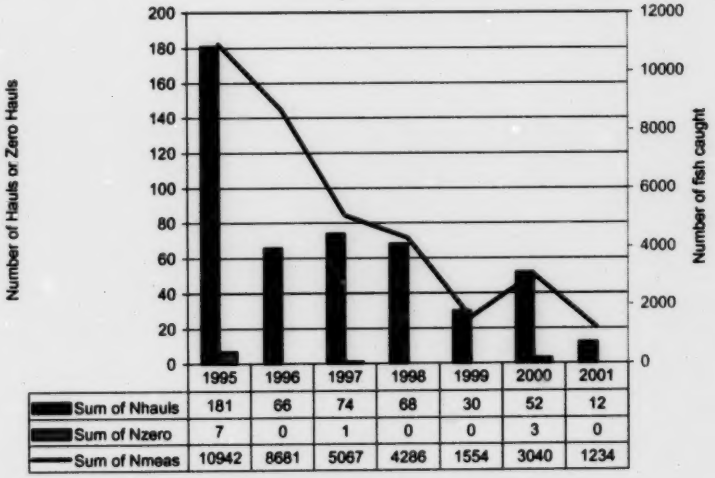


Figure 68. Relative length frequency (number at length / amount of gear) for control and experimental gears, Francois Linetrawl .



	1995	1996	1997	1998	1999	2000	2001
Sum of Nhauls	181	66	74	68	30	52	12
Sum of Nzero	7	0	1	0	0	3	0
Sum of Nmeas	10942	8681	5067	4286	1554	3040	1234

Figure 69. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Francois Linetrawl .

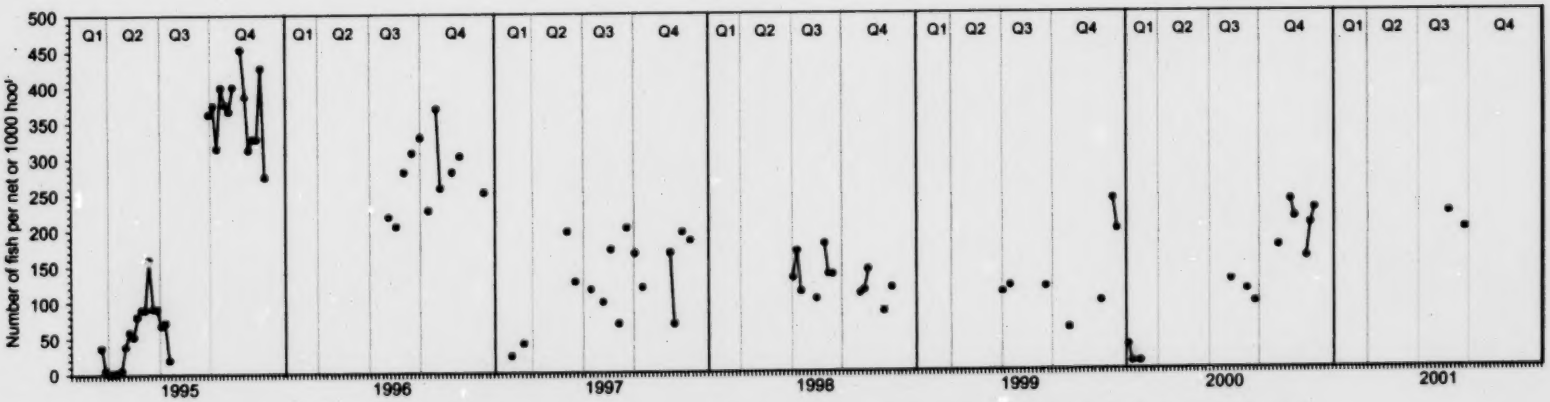


Figure 70. Catch per unit effort (in numbers of fish per 1000 hooks) for all sets (control and experimental) averaged for each week, Francois Linetrawl .

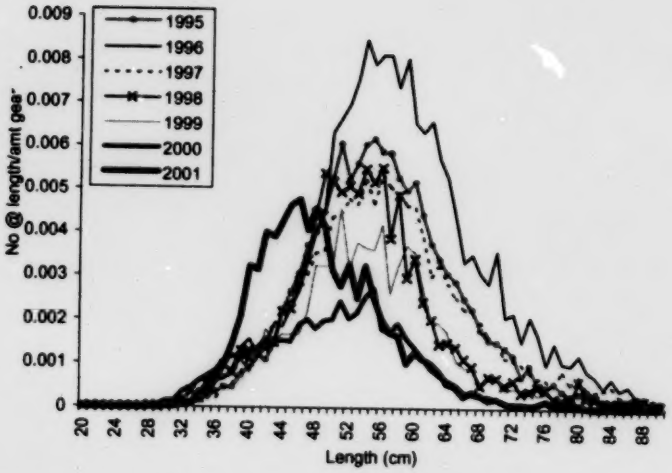
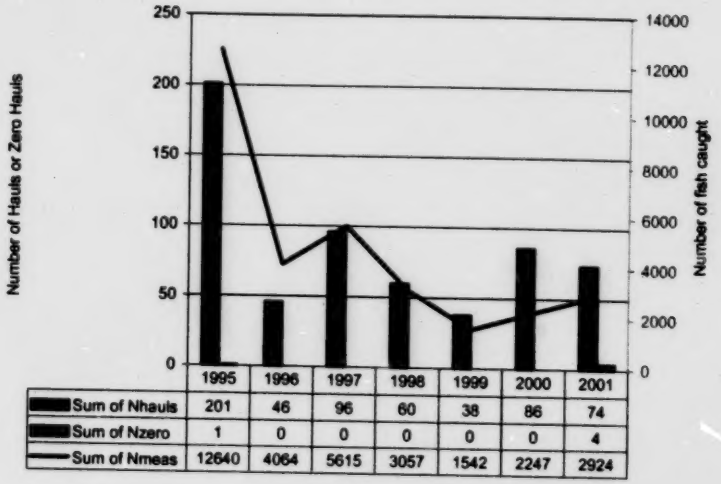


Figure 71. Relative length frequency (number at length / amount of gear) for control and experimental gears, Ramea Linetrawl .



	1995	1996	1997	1998	1999	2000	2001
Sum of Nhauls	201	46	96	60	38	86	74
Sum of Nzero	1	0	0	0	0	0	4
Sum of Nmeas	12640	4064	5615	3057	1542	2247	2924

Figure 72. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Ramea Linetrawl .

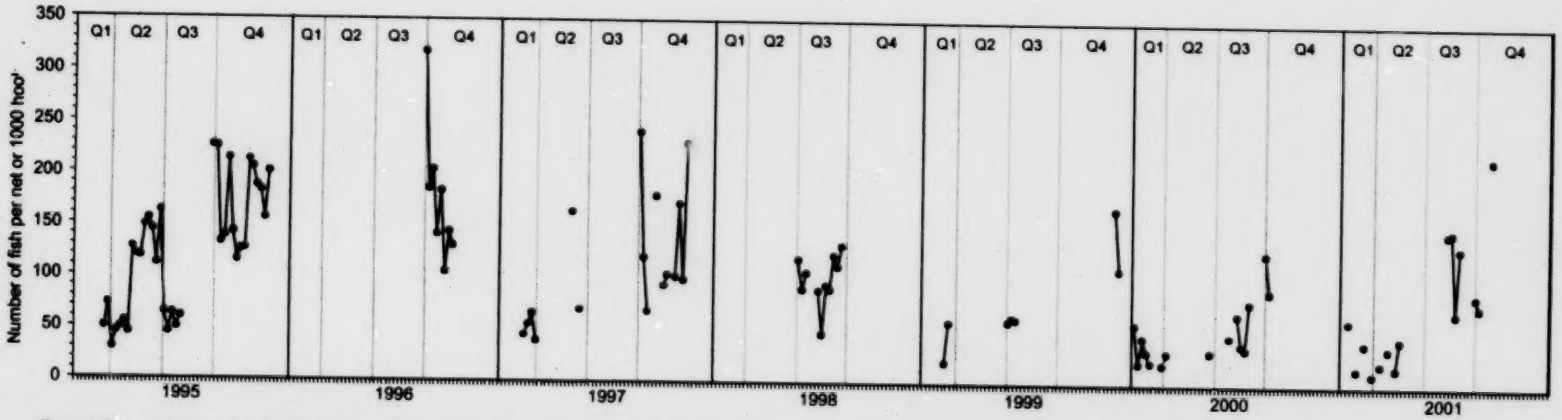


Figure 73. Catch per unit effort (in numbers of fish per 1000 hooks) for all sets (control and experimental) averaged for each week, Ramea Linetrawl .

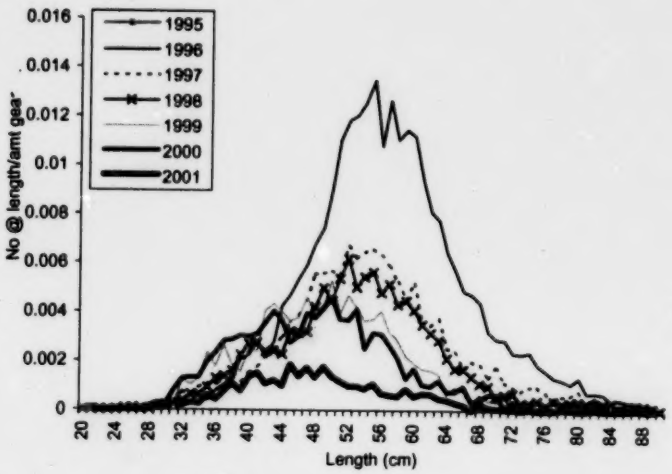
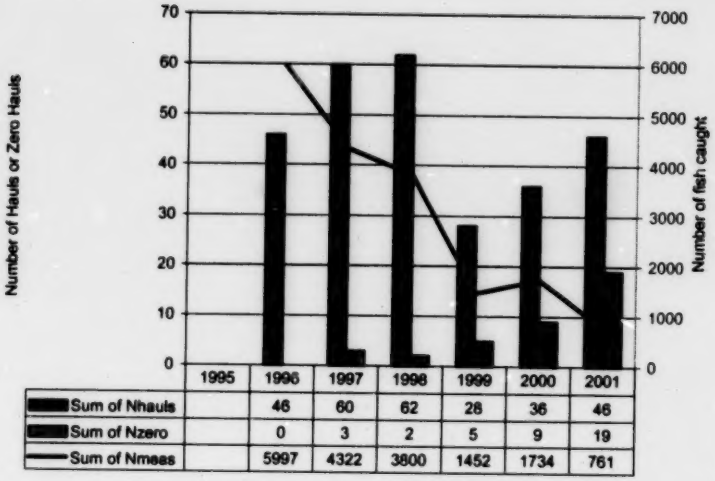


Figure 74. Relative length frequency (number at length / amount of gear) for control and experimental gears, Burgeo Linetrawl .



	1995	1996	1997	1998	1999	2000	2001
Sum of Nhauls		46	60	62	28	36	46
Sum of Nzero		0	3	2	5	9	19
Sum of Nmeas		5997	4322	3800	1452	1734	761

Figure 75. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Burgeo Linetrawl .

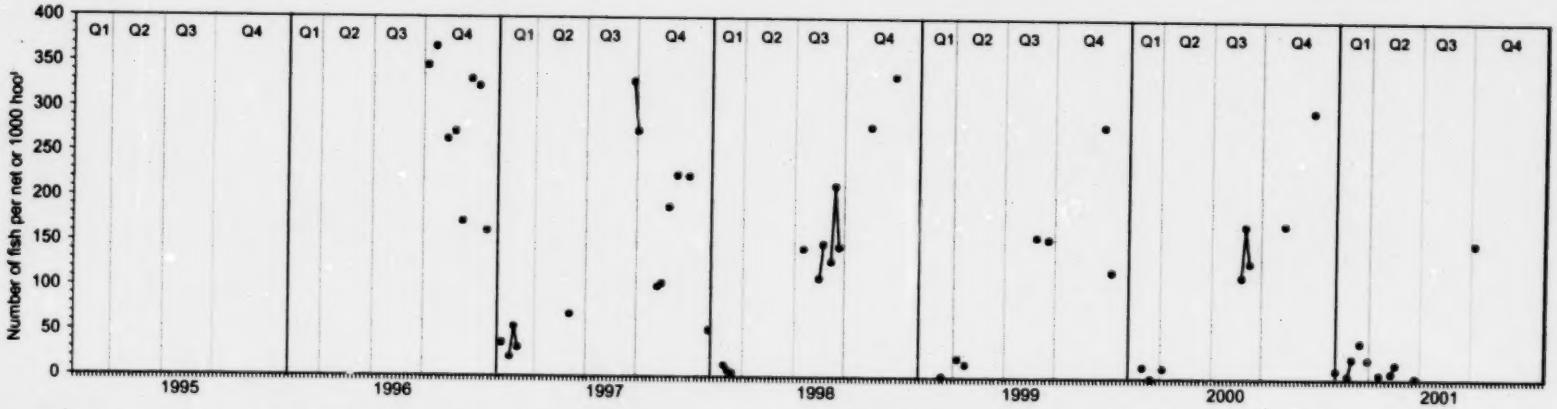


Figure 76. Catch per unit effort (in numbers of fish per 1000 hooks) for all sets (control and experimental) averaged for each week, Burgeo Linetrawl .